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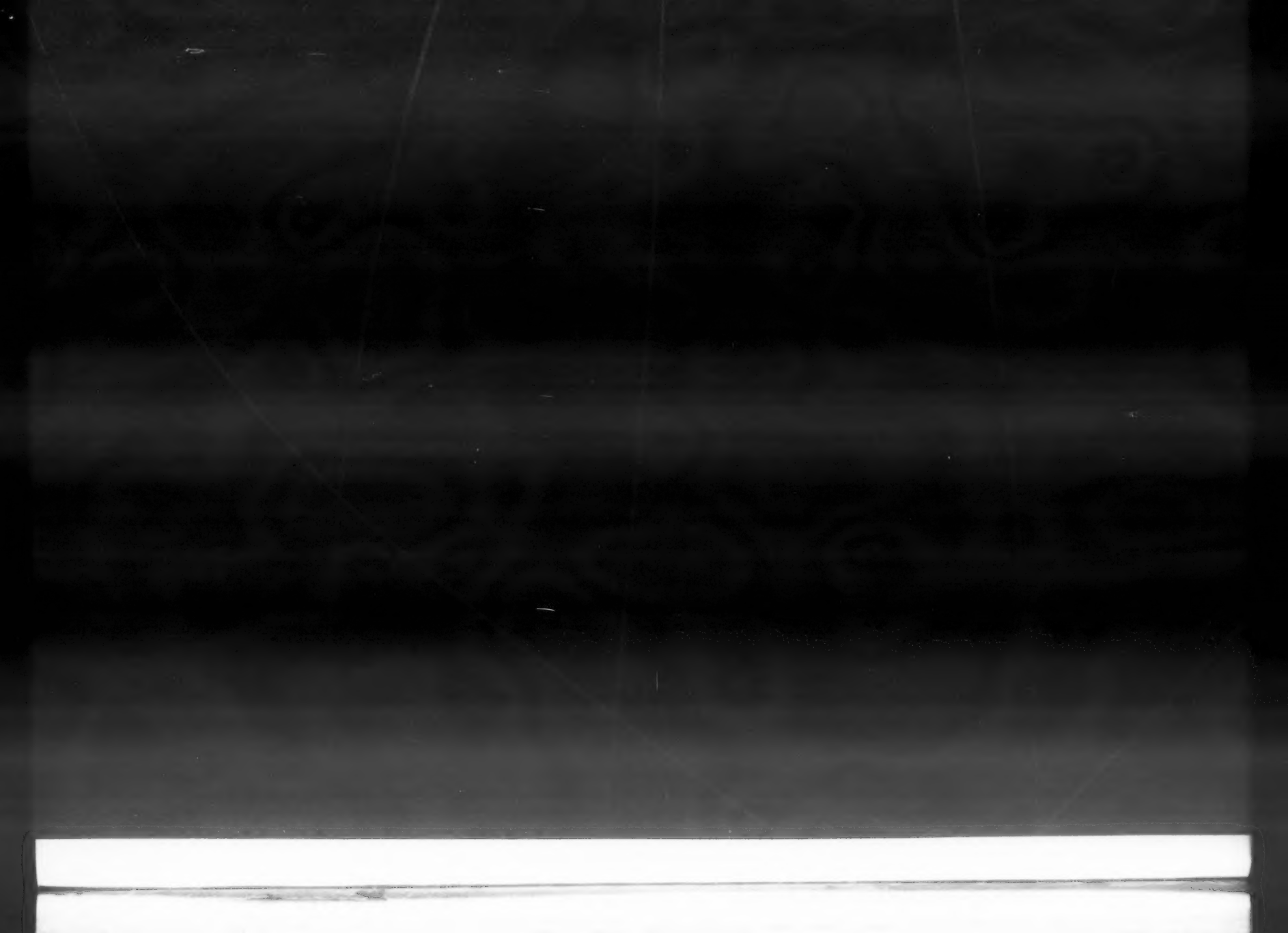

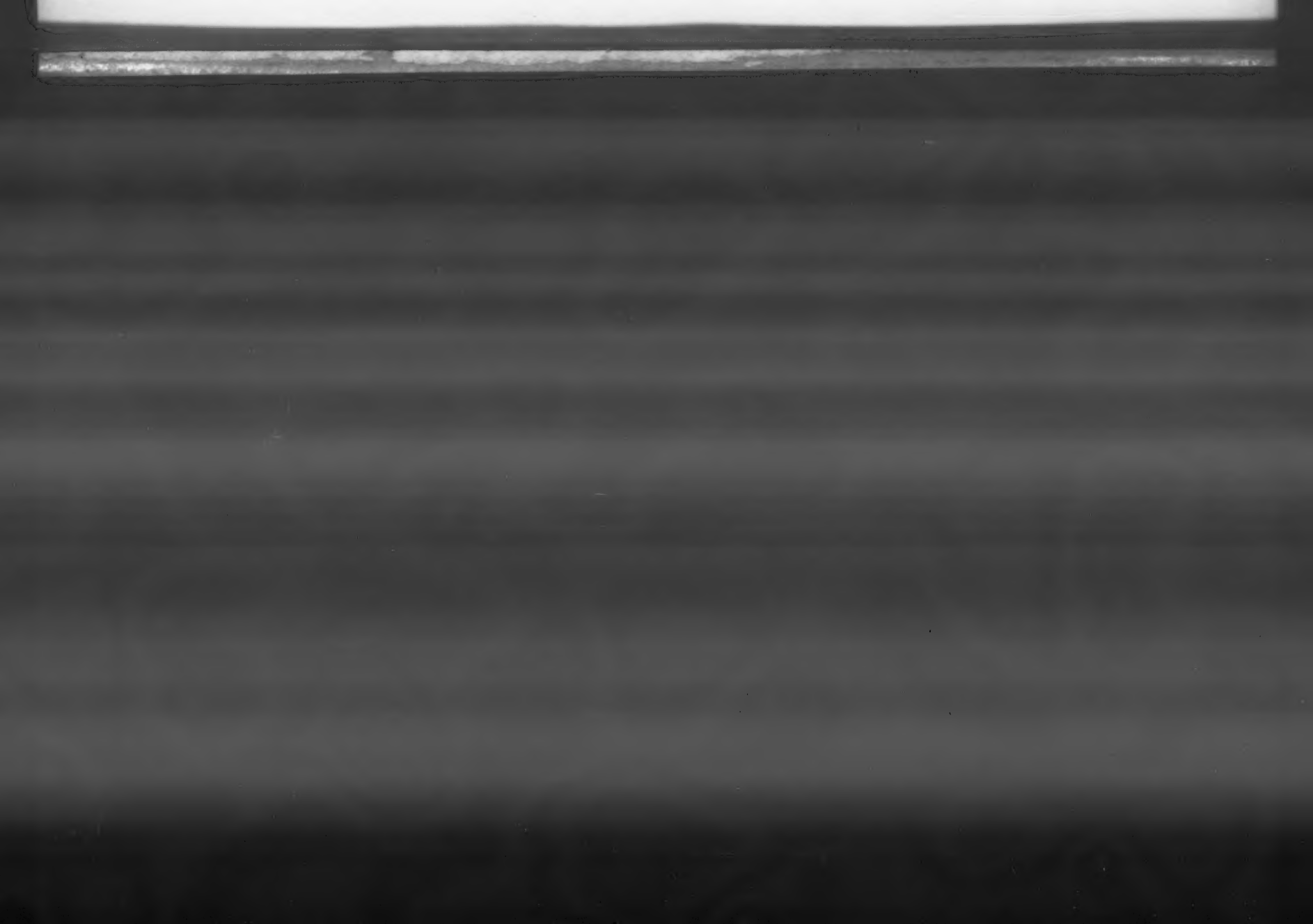

MUNICIPAL ENGINEERING

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THE POLLUTION OF THE PASSAIC RIVER AND ITS PREVENTION.

By Ernest Adam, City Engineer, Newark, N. J.

The Passaic River is the principal stream in the State of New Jersey. Its drainage area contains 949 square miles. It rises in Morris county, 600 feet above tide, and flows in a circuitous course for a distance of 83.5 miles into the Newark Bay, through which and the Kill von Kull it connects with the upper bay of New York. Navigation in the Passaic River is confined to the tidal part, which extends to the city of Passaic, about 13¼ miles above the head of Newark Bay; the mean rise and fall of tides in the bay is 4.7 feet; at Passaic it is about 3.3 feet.

The whole drainage area has been divided into three characteristic sections, viz: highland area, central basin and lower valley.

The highland area covers 483 square miles and is the gathering ground of the principal tributary streams; it also contains a number of lakes and artificial reservoirs. It is a mountainous region composed of granitic and crystalline rocks, having a general altitude of about 1,000 to 1,500 feet above sea level. The population is only sixty-four persons to the square mile and is largely concentrated in a few towns.

The central basin contains 290 square miles, forty-six of which are marsh or wet lands; the average of the floor of the basin is about 180 feet above sea level and that of the abrupt hills bordering the basin is about 600 feet above sea level. This is an agricultural territory, containing an average population of 120 persons to the square mile, centered in a number of large places. All but one of the principal tributaries discharge their waters into this basin, and as these streams have a sharp descent, their contents, during and after heavy rains, are poured so quickly and in such volumes into the flat area that the water is unable to pass the outlet at Little Falls, causing large portions of the wet lands to remain under water for days and even weeks.

The lower valley section, extending from Little Falls, contains a drainage area of 176 square miles. About nine miles below Paterson is the Dundee dam, 450 feet long and twenty-seven feet above mean tide, with storage area of 224 acres. From the dam to Passaic, four miles, the river has a fall of six feet; from this point to the Newark Bay, thirteen and one-half miles, it is a narrow tidal estuary. In a portion of the lower valley district, containing about sixty square miles, there are over forty cities, towns and boroughs, representing an aggregate population of about 4,200 persons per square mile.

From 1871 to 1892 the public water supply of Newark was taken from the Passaic River at a point about four and a half miles above the center of the city. Jersey City, the next largest in population to Newark in the State, also procured its public supply from the same source, about three-fourths of a mile below the works of Newark. Apparently no serious consideration was given at the time the river supply was selected to the fact that the Passaic was a tidal stream at those points and even further up and to the arising danger of pollution from domestic and industrial wastes above and below the intakes, especially from the rapidly growing city of Newark. Neither of the cities used mechanical filtration during the years that the water works were in operation; the one of Newark was abandoned in 1892 and that of Jersey City in 1896.

The abandonment of these supplies was an absolute necessity for the preservation of the health of the inhabitants of the two cities; the water was also

obnoxious to sight and smell. In 1896 Albert R. Leeds, Ph. D., stated: "I would feel less sense of danger in drinking the sewage effluent, as per samples sent from the East Orange sewage disposal works, than drinking the water of the Passaic River supplied to the inhabitants of Jersey City. Taking the albumoid ammonia as the measure of sewage contamination, the Jersey City water, with 0.01 grains per gallon, contains six times more sewage than the effluent waters from the disposal plant.

During the severe cold spell from Feb. 13 to 18, 1899, the draught on the available new water supply was so heavy that it was deemed necessary for protection in case of fires to draw water from the river at the old pump works. An outbreak of typhoid fever and intestinal diseases followed, and during the three following months 395 cases of typhoid had developed in the city, as against eight in the same three months of 1898. The dangerous character of the Passaic water was thus demonstrated, and at a time of the year when its noxious quality was likely to be rather less than at other periods of the year.

These cities are now drawing their water supplies from other sources.

In the year 1856 the first trunk sewer was built in Newark, with its outlet into the Passaic River. The sewerage system of the several municipalities was extended from year to year. Only a few years after the domestic water supply from the Passaic was abandoned by Newark and Jersey City, a general agitation was inaugurated by the people along the river and adjacent thereto, to obtain some remedy for the nuisance created by the filthy condition of the stream. In a report of the United States government on the flood in the Passaic River in 1902 the pollution of the lower section of this stream is considered one of the most aggravated cases to be found in the United States.

The continual agitation caused the State Legislature in 1896 to pass an act for a general system of sewage disposal for the valley of the Passaic River. The Governor appointed three persons, with power to employ engineering and other assistance, in order to carry out the intent of the act. They were to consider the various methods of disposal of sewage and the application of such methods to the whole or any portion of the territory, and to submit a printed report of their conclusions to the Legislature, without unnecessary delay. The title adopted by the appointees was "Passaic Valley Sewerage Commission."

The commission found Summit, Union County, the only municipality in the upper reach of the Passaic Valley having a sewerage system and discharging the effluent from filtering beds into the river. It is stated that the evidence of contamination practically disappears before reaching Little Falls (a distance of about 26 miles).

It has been said that the odors arising from the chemical treatment and intermittent filtration plant were objected to by people living in its vicinity. Perhaps for this reason and for the purpose of economy Summit has already abandoned or will soon abandon this plant, and connect the system with a gravity sewer which discharges the crude sewage into Staten Island Sound, within the city of Elizabeth. The main gravity sewer was built and is maintained jointly by seven different municipalities, not including Summit. The commissioners considered the river above Paterson in a generally fair condition.

After the Passaic passes the Great Falls at Paterson its character is completely changed; between that point and Newark Bay it receives about 70,000,000 gallons of sewage in 24 hours; the area drained by this part of the river is now inhabited by about 500,000 persons. The condition is of course aggravated during a protracted dry season, but during freshets and floods the high waters serve temporarily to cleanse the river from the excess of sewage. The estimated flow in the dryest month of an average year is 250,000,000 gallons per day from the entire drainage area, and for the wettest month of an average year it is 1,556,000,000 gallons. In the flood of 1882, which was considered the greatest in that century, the maximum flow was 18,265 cubic feet per second, or at the rate of 11,834,000,000 gallons in 24 hours; but the flood in March, 1902, broke that record, as the maximum flow at Dundee dam was estimated at 22,677 second-feet. Yet the flood in October, 1903, exceeded them all, the maximum flow, gauged at the same point, being estimated at 31,410 second-feet. It is evident that these volumes of water not alone purified the river, but scoured everything within their reach.

The territory considered by the commission for which relief was intended is 83.13 square miles, or a little less than half of the total area of the lower valley section; it contains 18 cities, towns, boroughs and other municipalities, twelve of which were discharging crude sewage into the river. The population as per State census of 1895 was 436,423.

After giving due consideration and study to the problem before them the Commission, in conjunction with the engineers, decided to recommend the construction of a joint main intercepting sewer along the west bank of the river, reaching from Paterson to a short distance beyond the southern limit of Newark, a distance of about twenty-four miles. At that point it was contemplated to erect the main pumps to lift and discharge the sewage after sedimentation, into Newark Bay through an outfall sewer about two miles long. If in later years it would prove necessary to divert the sewage from Newark Bay the method was suggested of conducting it to the outer harbor of New York near the eastern shore of Staten Island.

The intercepter was to provide sewerage facilities for a period of thirty years with an allowance of 150 gallons of water per person, per day, and an estimated population of 1,500,000. The estimated cost of the construction was $6,500,000, the cost of operating in the beginning $125,000, and ultimately $300,000.

The Commission in its report shows the expense of treating the sewage of London, at Barking and Crossness, in 1895. The amount of sewage treated was 250 millions of gallons per day (about the same amount as estimated for Passaic Valley district), from which were extracted 6,000 tons of sludge by means of sixty-seven tons of lime, besides other chemicals; the operating expenses for the year were $507,000, and the cost of the two precipitation plants and of the ships used for transporting the sludge was $4,729,000.

When these enormous sums of money are considered, it is not surprising when communities take advantage of their proximity to deep sea water to discharge their waste waters into it.

Another act was passed in 1898, giving the Governor the power to appoint Commissioners, "to consider the subject of the pollution of the rivers and streams within the State, and to provide a plan for the prevention thereof, and for the relief of the persons and property affected thereby, and to provide for the expenses necessary for the purpose."

The Commissioners in considering the pollution of the Lower Passaic particularly, sent a general form of inquiries to the communities within the drainage area of the proposed sewer. The most of them were in accord with the plan of a main intercepting sewer, as was outlined by the former Commission, stating that there was not suitable and sufficient land within their own domain to treat the sewage, and that it would not be likely that they could locate a plant within the borders of another. The person responding for the city of East Orange mentioned the costly experience which that municipality had in chemical treatment and intermittent filtration of its sewage. The plant had cost about $100,000, and the treatment nearly $25,000 per year, for a daily flow of 1,330,000 gallons, of which over one-half was ground water. In this instance there is a case where the admittance of ground water into conduits of a separate system, as was considered beneficial or harmless by some of the society at the last year's convention, had proved to be expensive. The plant was abandoned about ten years ago.

Another Commission, consisting of five members, was organized in 1899, called the "State Sewerage Commission." Under this act power was only given to veto new sewerage systems which the Commission might deem injurious to the public, as its consent is required for new systems. The Commission considered it necessary to have additional power in order that it might compel municipalities, already having sewerage systems, to adopt measures whereby injury would be prevented to the streams and the owners of property along their banks. This Commission also sent circular letters to all municipalities in the State, seeking statistical information, as to local population, topography of site, water supply and consumption, and various items relating to sewerage.

In the session of 1900 the Legislature passed another act amendatory to the previous one, concerning the State Sewerage Commission; it also authorized the creation of sewerage districts and sewerage district boards, making the members of a board elective from the established sewer districts, and a body politic and corporate, with powers to construct sewers and drains within the district, and to bond the same for moneys required.

The State Sewerage Commission submitted a report to the Legislature of 1901, which principally related to devising systems of sewerage in the lower valley district. Having procured additional powers and monetary means, the Commission divided the sewerage district into two sections for each of which they appointed engineers who were familiar with their respective territories, to study and report upon several methods of sewerage

and sewage treatment, which were defined by the Commission, and also to report upon the probable cost of each device.

After the plans and data were received from those engineers the whole matter was submitted to three consulting engineers, who were selected by the Commission, being Messrs. R. Hering, J. J. R. Cross and William M. Brown. I quote a part of their report verbatim: "We are satisfied, after careful examination of the proposition to this effect, elaborated by Messrs. Fteley and Jacobson, in 1897, and the more detailed studies of Messrs. Wise, Watson and Ferguson, and Mr. Owen, made under your direction, and by our own studies of the question, that a union of all the communities which contribute

ERNEST ADAM,
City Engineer, Newark, N. J.

to the pollution of the Passaic River, in constructing a single trunk sewer from Paterson to the southern boundary of Newark, and arranging for a joint final disposal of the polluted waters, will be more economical in construction and maintenance, than the construction of separate transportation conduits and disposal works for separate communities, or than any combination of two or more such communities with separate works for disposal.'

The plan proposed by the consulting engineers was similar to that of Messrs. Fteley and Jacobson, but having only one pumping station on the main trunk sewer, and the outfall sewer discharging into Upper New York Bay, instead of Newark Bay. The discharge into the former will be forty feet under the water surface, and close to a main current which is seventy feet deep. The same ultimate population of the entire district was estimated at one and one-half millions, but the sewer was increased in size so that it would convey, at its lower end, 270 million gallons of sewage per day, instead of 225 million as previously assumed. Newark and Paterson are the only places within the new sewerage district where the present sewers are designed to carry sewage and storm water combined. The amount of sewage per day to be contributed by each was assumed to be 230 gallons per person, 100 of which was assumed to be contributed by the first wash of the streets during a heavy rain.

Finally the matter was entrusted to a district board, appointed under a new act of the Legislature, approved March 27, 1902, "authorizing the appointment of commissioners in sewerage and drainage districts, created for the purpose of relieving the streams and rivers therein from pollution, and to provide a plan for the prevention thereof, and providing for the raising, expenditure and payment of monesys necessary for this purpose," its title being Passaic Valley District Sewerage Commission.

Mr. Rudolph Hering was also chosen by this Commission as their consulting engineer.

The route of the main sewer selected by the Commissioners is practically the same as was recommended by the other, but a greater capacity was assumed, based on a daily flow of 326 million gallons through the terminal part, when running only three-quarters full; the estimated population was also increased to 1,617,000.

The total length of the main intercepting sewer is to be nearly 21 1-3 miles, its size varying from 4 to 13 feet, and with a difference in elevation of the inverts of 54.6 feet, the invert at the lower end being 25.5 feet below mean high water. The maximum lift at the main pumping station will be about 40 feet. The outfall sewer from the pumping station to the Upper New York Bay consists partly of two lines of 6-foot force mains, of a 13-foot gravity brick sewer and of one line of 8-foot steel pipes; in all 5¼ miles. The total estimated cost of the main and branch sewers, about 37 miles, together with the appurtenances, is $8,691,400, including contingencies and supervision. The maximum estimated cost of maintenance is $544,500 per annum.

The cost of construction is to be assessed upon the different municipalities within the sewerage district, in proportion to the respective tax valuations, and the cost of maintenance in accord-

ance with the quantity of sewage discharged into the main intercepting sewer; the same methods which had been applied by the Metropolitan Sewerage Commission of Boston, Mass.

The Passaic Valley Sewerage Commissioners also took the precaution of securing the opinion of the United States officer in charge of New York harbor and vicinity, in relation to the intended discharge of sewage. His opinion was that it would not interfere with navigation or form an obstruction, especially as it was intended to remove the floating particles of the sewage and settle the heavy ones before the sewage is pumped.

The Commissioners have not begun any work upon the intended sewerage system. In September, 1903, Paterson, the second largest city in the district, contested the constitutionality of various points in the act creating the Passaic Valley Sewerage Commissioners. The Supreme Court, in July of this year, declared the act constitutional in all its parts, but Paterson carried the case into the highest court of the State, where a decision upon it is expected next November.

SEWAGE DISPOSAL FOR SMALL CITIES AND TOWNS.

By T. Chalkley Hatton, Consulting Engineer, Wilmington, Del.

It may be well to outline the several systems of sewage purification commonly used in this country.

Broad irrigation should, in the writer's opinion, be considered of first importance as a method of sewage disposal for small cities and towns because it is a system by which the manurial products of the sewage are used to enrich the soil. The land to be treated should be located upon a gently sloping hill, and laid out in furrows around the hill placed one above the other, as for planting cotton, except that the furrows are placed several feet apart, such space to be adjusted according to the porosity of the soil, and each furrow to be at the same elevation throughout its length.

Under the ground, at a depth of from three to five feet according to the nature of the sub-soil, tiles are laid nearly at right angles to the furrows and to a collecting drain at the lower end of the field, this drain being connected with the nearest available ditch or water course. The sewage is brought to the top of the field either by gravity or by pumping, and, by a system of gates built into a sewer carried down the center of the field at right angles to the furrows, it is allowed to discharge into these furrows, one after the other, until each furrow has all it can hold, when another tract prepared as the first one is dosed. The sewage is absorbed by the land, a proportion of the liquid reaching the under drain, through which it is carried to the ditch or water course, and if the field is properly worked the effluent thus discharged into the ditch or water course may be harmless. The crops are grown both upon the edges of the furrows and upon the spaces left between them, they grow very rapidly and where the conditions are favorable, can be made to pay for the cost of operation. With ground fairly well located and of good texture the sewage from sixty-five persons can be thus treated upon one acre of ground, which can be prepared at a cost of approximately $125.00. Unfortunately this system of sewage treatment can not be used with advantage in the middle or northern sections of the United States because there are several months in the year when the temperature is too low for growing crops, but in the southern sections the crops can be made to rotate constantly upon these irrigating fields, especially tobacco, rice and small truck, and the soil in many portions of the Gulf States is particularly well adapted to broad irrigation, and large tracts of ground are available close to many of the cities and towns.

Sub-surface irrigation consists of laying lines of small tile a few inches under the surface of the ground to be irrigated. The joints at the sides of the tile are left slightly opened so that the liquid can escape into the ground, and a few feet under the ground, and under drains are laid to the nearest water course. The sewage is brought to the field, is discharged into the upper tiles, whence it finds its way into the ground just below the surface, and is thus taken up by the roots of the growing crops, the remainder sinking through the ground to the under drains below, through which it is carried to the nearest water course, and this effluent may be made practically

pure if the field is not overworked. This system has some advantage over broad irrigation inasmuch as the surface of the ground is smooth and the crops can be easily planted and harvested in the usual manner. The sewage from 100 or 200 persons can thus be treated on one acre of ground, but the latter must be fairly porous and must not contain strata of heavy clay above the under drains. The cost of preparing an acre of such ground would probably be $1,600. This system can be used in a somewhat colder climate than broad irrigation, but should be confined to localities where frost does not penetrate for any length of time to the depth of the sub-surface tiles.

Surface irrigation has been used but little in the eastern section of this country, although it has been tried with some success in the sandy soils of lower California. It consists of preparing a sloping tract of ground with a system of ridges from one and one-half to two feet in hight which are made of cinders, small stones, gravel or any other available porous material. These ridges are built around the slope and as nearly parallel with each other as the contours of the ground will allow, and at the bottom of the slope a collecting under-drain is laid and led to the nearest water course. The sewage is discharged upon the summit of the slope, it covers the first space above the first ridge, passes through the porous material which composes the ridge, which thus stops its velocity of flow and gives the ground time to absorb much of it, the balance flows through the ridge, over the next space and into the second ridge where the ground again absorbs some of the liquid, and so on to the bottom of the slope where it is collected by the under drain and is thus discharged into the water course. The effluent from this system is of doubtful quality because the ground gets very little time to absorb the sewage, and most of the purification is done by oxidization and nitrification taking place in the ridges, which give the bacteria good opportunities for work. The writer has met with a few localities where this system would admirably answer all conditions. The construction and operation of the system is very cheap and it can doubtless be used to great advantage in many localities where a high standard of purity for the effluent is not sought.

Intermittent land filtration is one of the popular systems of sewage disposal, and is probably the most successful system used at present in this country. It consists of preparing a reasonably level tract of ground with level beds of from one-half to two acres in area, surrounding each with low earth embankments so that each may be entirely separated from its neighbor, laying under drains under each bed from three to five feet in depth and from twenty and fifty feet apart, according to the porosity of the ground, connecting these with a main collector at one end of the bed, and leading this collector into the nearest water course. Bed No. 1 is first dosed with a sufficient volume of sewage to cover its surface to a depth of from six to twelve inches, when the sewage is turned into bed No. 2, and the sewage in the first bed is allowed to settle through the ground slowly to the under drain below. In its travels it is purified by the work of the myriad of colonies of bacteria existing upon and near the surface of the bed and contained within the sewage, and the effluent reaches the under-drain almost pure enough to drink. The bed is then given a period of rest from two to six hours, which is necessary to give the bacteria time to complete their labors and to thoroughly aerate the beds; that is give the beds time to absorb oxygen. To operate this system successfully the ground must be free from heavy non-porous clay, a mixture of clay and sand or gravel in the proportions of three to one being about a limit. One man is all that is necessary to take care of fifteen to twenty acres of beds, except in harvesting the grass which grows upon the surface of the beds. The cost of construction runs from $1,500 to $2,000 an acre and each acre can care for the sewage from 1,800 persons providing a surplus area of one-half acre is provided to give the needed rest to the acre of beds. In fact should a population of 1,800 persons only be considered it would be necessary to practically double the area for such a limited population. The rate of 1,800 to the acre is included as a limit.

Intermittent land filtration is applicable in a majority of places in this country. Temperature has little effect upon its operation and the proper quality of land is most frequently available. Its results are more uniformly satisfactory than any other system partly because it requires a lower standard of intelligence to properly operate it than any other system, and, while it is expensive to con-

struct it requires a limited area of ground, and is operated for almost nothing. In fact its numerous advantages over other systems recommend its wide use throughout this country.

Land disposal is a system of discharging the sewage upon broad areas of fairly porous ground at intervals for the purpose of inducing the growth of crops. There is no under-draining resorted to, but the ground is expected to absorb all the sewage and liquid discharged upon it. The system is applicable to but few localities in this country. It requires great areas of land, which must be light sandy soil, qualities which are rarely available within reasonable distance of any city or town. Besides the people of this country are in a habit of using such a large quantity of water for domestic purposes that the proportion of manurial products is small when compared with the large volume of water discharged upon the land. The system should be popular and a self-supporting one in the arid sections of this country, but could not be introduced in sections elsewhere.

Chemical precipitation is a system which took fast hold of this country some fifteen years ago and consists of injecting into the sewage some precipitating chemical such as sulphate of alumina, lime or oxide of iron, after which the sewage is retained for several hours in water tight compartments or beds to allow the chemical to perform the work of separating the solids held in the solution of the sewage and carrying them to the bottom of the tanks in the form of mud or sludge. It is claimed for this system that the solids thus settling in flocculent masses catch and hold the harmful bacteria contained in the sewage and they are thus carried to the bottom. The effluent from these compartments or beds is sometimes discharged upon intermittent filtration beds, sometimes upon broad irrigating lands and sometimes directly into the nearest water course. The sludge is gathered up from the bottom of the tanks either by a sludge pump or by hand, and burnt or made into a compost. When the effluent has been directly discharged into the water course without further treatment it has not heretofore been possible to obtain a very high standard of purity.

The system is not only an expensive one to construct, but it has been found a very expensive one to operate. The cost of the chemicals used becomes a large factor in the expense, and the disposal of the sludge has proved to be a troublesome item. It was at first thought that this sludge would prove of commercial value to the farmer, but this has not been the case, and it has been burned with much expense. One of the worst features of this system is the great care necessary to successfully operate it. It requires professional men about it at all times to test the influent and effluent and thus determine the amount of chemicals necessary, as the strength and quality of the sewage changes hourly throughout the day. In some places where this system has been adopted the authorities felt the services of these professional men were too expensive and have put their work in the hands of unskilled men, with the result that the effluent is not satisfactory and the cost of the chemicals has been enormously increased. In fact the system can hardly be recommended for adoption by small cities and towns.

Septic treatment consists of discharging the sewage into either closed or open water tight compartments large enough to permit of the sewage lying within the compartment in a quiescent state for a certain period of time, from two to four hours according to experiment.

It is claimed that during this time the nitrifying influences, or work of the colonies of bacteria contained in the sewage, purifies it and results in a reasonably pure effluent without further treatment. There are various devices in the market which are introduced in and about the installation of septic tanks, such as aerators, for which the patentees claim merit, and no doubt these claims have been substantiated in numerous instances, but it is the writer's judgment that a septic tank treatment is not the "cure for all ills" nor is it applicable to all cases as is so frequently claimed. The builder loses sight of one very important point which has heretofore been mentioned, that the strength and quality of the sewage from any community varies hourly, and yet a septic tank is constructed to purify automatically every kind of sewage in the same way and during the same period of time, which is a practical impossibility, that is, if the same standard of purity is to be maintained.

When the local conditions do not warrant an uniform standard of purity, or a high standard, the septic tank, in many cases, is just what the small city or town should adopt. Its installation is very cheap when compared with the cost

of the other systems mentioned herein, and its cost of operation is practically nothing, and these are the two points which have made the septic tank so popular in this country. There is no denying the fact that the community will rest easy and sleep well if they feel that their sewage, or the sewage of their neighbors further up the stream, is being purified. They little question what standard of purity is being maintained.

Bacterial treatment by single and double contact beds consists of discharging the crude sewage upon prepared beds of clinker, cinders, coal culm, crushed stones or some other equally porous material

These beds are made from three to seven feet in thickness. The sewage is retained in the beds to a depth of from six to fifteen inches above the top of the filtering material for a period of from one to three hours during which time a certain amount of purification has resulted from aeration and the work of the bacteria contained in the sewage. The effluent is then discharged into the water course or upon a lower and similarly prepared bed of somewhat finer material, where it goes through the same process. The beds are allowed to rest for several hours between doses so that they can become thoroughly aerated and the bacteria can properly digest the food they have taken. This system has just been introduced into this country and has proven fairly successful where a high standard of purity is not required. Its construction and operation can be reduced to a small cost, the first by using earth embankments about the beds and the latter by the use of automatic siphons by which the beds can be discharged at stated periods without any attendance. The system seems particularly well adapted for small cities and towns for several reasons, among which may be named the low cost of installation and operation, the uniform standard of effluent obtained, lack of any attendance, which in the case of small communities is so difficult to obtain of a trustworthy kind, and the absence of any offensive odors from the beds, so that they can be located in proximity to dwellings, without nuisance. No special kind of soil is demanded, and the filtering materials are nearly always available. Two acres of double contact beds can satisfactorily treat the sewage from a population of possibly 4,000 persons, leaving one-fourth out of use for emergencies, and the cost per acre for construction depends largely upon the cost of the securing and transportation of filtering materials.

Intermittent sand filtration, combined with aeration and mechanical separation, may be placed in the same class as they act in much the same way. The beds are usually placed at some elevation above the ground or collecting channels, and consist of fine sand, charcoal or coal culm upon which the sewage is discharged, either intermittently or continuously. The sewage and water pass through these beds and drop through the air to the collecting channels below. So far this system has not secured a standard of effluent which would commend itself to communities where even a reasonable standard of purity was required. It is somewhat difficult to operate in cold climates owing to the ice bed forming around the collecting channels and about the plant. The wind carries the drops of water, as they fall from the bed, outside of the collecting channels and scatter them broad cast in the vicinity of the filters.

Electrical treatment has been but little used in this country, but consists of injecting into the sewage a solution of salt water which has been subjected to an electric current. What purification takes place the writer is unable to state as he has never seen the record of any analysis taken of the influent and effluent.

A large number of sewage disposal plants, as they are now operated, are a combination of two or more systems herein briefly described. Even the much advertised septic treatment is frequently combined with intermittent land filtration, contact beds or surface irrigation. But all the systems, with the possible exception of chemical precipitation and electrical treatment, depend upon the micro-organisms contained in the sewage itself, and in the material with which the sewage comes in contact, to induce putrefaction and the final destruction of harmful organic substances to harmless ones, and the judgment of the engineer in designing the disposal plant is exercised best in determining the most available and best adapted media for the protection, propagation and life of these desirable and absolutely necessary micro-organisms.

It is the writer's experience that in considering the question of sewage disposal for any community it will likely prove fatal to proceed upon the plan that what proved successful for one place will

prove equally so for another, because the quality of sewage is rarely alike owing frequently to the presence of a mineral product in the water supply of one town that is entirely foreign to that of another, also to the liquid refuse from an industrial establishment in one place of which there is nothing similar in another, or the water is used in larger volume per capita in one city than in another, and many other causes which will affect the question. Also the availability of the natural filtering media is as much to be considered as is the question of cost of construction and operation. In fact these three questions are interdependent, but it has proven invariably true that there are always predominating reasons why the judgment of the engineer determines upon one of the plans outlined in this paper as best suited to all the conditions, unless he is prejudiced in favor of some special system, or unless he has a device to sell. In either case he is a very unsafe adviser for any community.

There is no community which need become alarmed for the future of its sewage. It can be safely disposed of by some system. The serious problem is to determine the best.

SEWAGE DISPOSAL.

By J. N. McClintock, Boston, Mass.

Near the shore of Casco Bay a summer cottage was built last spring. It is situated on a gentle rise of land overlooking a cove and well illustrates the difficulties encountered in an establishment where all modern conveniences are to be found in the house and where there is no natural way to care for the sewage without causing offense. In the case referred to the drainage of the premises is into the cove where sea bathing is permissible, if sewage is not admitted to pollute the water and the shore.

The problem to be solved in sewage disposal was one of importance, because if the cove was polluted with sewage the beauty and attraction of the whole place would be injured.

A septic tank was built toward the shore, 120 feet from the house. The six-inch sewer pipe serving the premises was trapped near the house and the sewage was admitted to the tank through a T-pipe, one arm of which reached below the surface of the sewage at rest in the tank, while the other arm was connected with the surface of the ground and was protected by a pottery screen. The water in the tank stood five feet deep when the tank was full. The tank was oval in shape, held 1,000 gallons, had a common manhole cover and permitted the sewage to flow out of the tank from a point two feet below the surface.

Sixty feet beyond the tank was a chamber holding 250 gallons with a common Miller six-inch siphon, constructed to automatically discharge the contents of the chamber when full.

One hundred and thirty feet farther along toward the beach was a filter of assorted gravel five feet in depth, thirteen feet long and ten feet wide, provided with distributing channels of brick and covered with broken stone beneath a layer of loam and sod. The final outlet pipe was carried fifty feet beyond the filter to the neighborhood of the beach.

The ventilation of the system was unique. There was a three-inch vent from the septic tank above the sewage to the sewer beyond the outlet of the tank; a similar vent to the siphon chamber, and the air space above the filter was connected with the underdrains and final outlet pipe by means of a vertical pipe and two quarter bends of six-inch pipe in the form of a semicircle with the curve uppermost. By this method the resulting gases formed in the tank were not confined in the system, but escaped through the loam over the filter bed or through the final outlet pipe.

The surface of the ground above the works gives no indication of what is beneath; the manhole covers of the tanks are the only visible evidence of the works.

It is estimated that the septic tank would receive a full capacity of 1,000 gallons of sewage a day; that the siphon chamber would discharge at average intervals of six hours; that the water from the same would cover the filter beds at each discharge to a depth of three inches, and that during the twenty-four hours six and one-half cubic feet of gas would be evolved. If for any cause bac-

terial action in the tank should cease and the solid matters accumulate therein, the accumulated solids could be removed as from an ordinary cesspool. It is estimated, however, that this system will be operative for many years to come with no attention whatever; that the waste matter consigned to the sewers will be disintegrated in the septic tank; that the effluent received on the filter will be purified, and that the final effluent, entering a small rill, will give no offense in the neighborhood.

There arises in a congested civilized community the problem of how to dispose of the waste matters to the best advantage. The engineer is called upon

J. N. McCLINTOCK, BOSTON, MASS.

to solve the problem. A maritime city has its beginnings about some commodious harbor inviting commerce. If it is found that the harbor is an improper place to deposit the waste matters of the city without serious injury to the harbor itself, its marine life and the health of the inhabitants living thereabouts, some other method of sewage disposal than so-called dilution must be adopted. This should be a self-evident proposition and not necessary to be argued.

In the case of fresh water rivers and lakes the conditions are somewhat different; decomposition is not chemically retarded by the constituents of the water, but, on the other hand, the bacteria are afforded a better opportunity to propagate and to become dispersed.

What shall be said of the city that discharges bacteria-burdened sewage into the reservoir or lake from which its water supply must be drawn, or into a river from which the water supply of a sister city must be drawn? Today this is not the exception, but the rule throughout this country.

As member of the American Society of Municipal Improvement, I would ask you the question: Is there a municipal improvement of more importance than the proper disposal of sewage and the purification of water?

I believe it is possible with our present knowledge of zymotic diseases to stamp them out absolutely from every civilized community. The bacteria of disease are enemies minute in size but of dread power and fearful potency. They do their work stealthily but effectively. They are foes of our race worthy of the most serious consideration and are to be met and combated by all the resources of science and experience.

It seemed at one time that the advent of water-borne sewage in a community, while undoubtedly a convenience, only served to more widely spread abroad disease germs, but later developments in our knowledge of sewer construction make it possible to correct this fault and to collect all waste and harmful bacteria in the sewers and thereby carry them to the septic tank and filters wherein they may be eliminated

If sewage is retained from twelve to thirty-six hours in a septic tank with a depth of five feet or more, provision being made for resulting gases and the effluent is emitted in such a manner as not to disturb the surface of the sewage at rest, there results a bacterial breaking up of organic matter more or less extensive. If the effluent from the tank be thoroughly oxidized in a filter bed the final effluent is rendered harmless. It is immaterial whether the most purification takes place in the septic tank or in the filter, as long as it is brought about in one or the other place. Supposing that sludge accumulates in the septic tank, it is good practice to so build the tank that sludge can be removed in any event. If the filter becomes clogged that fault can be corrected. So it is the best practice to build the tanks and filters in series, so that alterations and repairs may be made without interfering with the action of the system as a whole.

THE SEWERAGE SYSTEM OF LITTLE ROCK, ARK.

By Walter F. Reichardt, City Engineer.

In April, 1881, a number of public-spirited citizens of Little Rock, Ark., held a meeting in the City Hall of that city for the purpose of devising means for the construction of sewers. At this meeting a petition was drawn asking the City Council to take the necessary steps toward the making of local improvements in the way of sewers, under the provisions of an act of the General Assembly, entitled an "Act to regulate the manner of assessing the real property for local improvements in the cities of the first and second class," approved March 22, 1881. And it was at the following meeting of the Council that a district was formed and designated as Sewer District No. 1.

All improvements in the city of Little Rock are made by improvement districts, which are formed as follows: When ten or more owners of real property in the city and in the territory thereinafter designated petition the Council to form a district, and if said petition is granted, the district is formed. After the district has been formed the petitioners present to the Council the names of three owners of real property in said district to act as a Board of Commissioners, and if such names are satisfactory to the Council, these three men are elected commissioners and thereafter have entire control of said district. All contracts are let by the commissioners and all work is done under the supervision of their engineer and is accepted by them and they have complete control of the improvement until turned over to the city. When all assessments have been paid and the district is free from debt the district is turned over to the city, which takes charge of same and keeps it in repair.

In the selection of commissioners for sewer districts as well as other improvement districts, the most competent men are not always chosen, and sometimes men who are not at all familiar with the improvement are selected. Therefore, the writer believes that some of the commissioners of the sewer districts are to blame for the present condition of the sewerage system as well as that class of men known as "engineers." In the same manner engineers are engaged by the commissioners, not, perhaps, because they are the most competent in the city, but because of their influence with the commissioners. As a general rule the engineers were paid but small salaries and could not give much time or attention to the work. It was not how competent is the engineer, but how cheap will he work. But in the last districts the city engineer has been employed and as a result better work has been received and the future interests of the city have been looked after. In a number of instances the commissioners intended doing their best, but on account of the lack of knowledge of the improvement, did not get the results that they would have gotten had they been better acquainted with the subject.

Sewer District No. 1 was constructed in the business center of the city and was built of 21-inch vitrified clay pipe. At the time of the construction of this sewer, the pipe was large enough for the district it drained, but the commissioners failed to realize that this district would serve as an outlet for the greater part of the sewers of Little Rock. In 1880 Little Rock had a population of 13,000; the estimated population at the present time is 50,000. Little Rock has a total area of 11.45 square miles and the total length of sewers is twenty-eight miles with two miles under construction. On account of its high elevation above the river and topographical situation, Little Rock is well adapted for an excellent sewerage system. There is but a small part of the city that would be without sewerage today had the present sewers been built with the view of draining the whole city.

Reliable information has been received that Sewer District No. 1 was constructed entirely without regard to any other part of the city, and instead of using a minimum grade a mixmum one was used.

This was not the only district built without regard to the future growth of the city, but district after district was so constructed, until a few years ago the people realized that they were not constructing sewers that would meet the demands of a large city.

As an example of the crowded condition of these districts, I call attention to District No. 7, which is in the business center of the city, and was constructed of 10 and 12 inch pipe. District

after district has been built and connected to this sewer until at the present time about fifteen miles of sewers empty into No. 7.

That you may have an idea of the manner in which the sewers were constructed I will give in detail a few methods of construction used by the engineers and contractors in charge.

The sewers are constructed of vitrified clay pipe, the size of which varies from six to twenty-one inches, the greater part, however, being eight and ten inches in diameter. In the business section of the city some 21-inch mains are in use, but these extend for only a few blocks.

The soil of Little Rock is for the most part red clay and gravel and is very easily handled and gives the pipe an excellent foundation. In very few cases sheeting has been used and sewers have been constructed with a cut of twenty-two feet without the least bit of caving.

It has been the case that when contractors came in contact with soft ground or when water had gotten into the ditch, but little more care was used in laying the pipe then than if they were working on a solid foundation. It has not been the custom of the majority of the engineers to remove the soft material, and replace it with dry earth, but on the contrary they would place a few rocks under the bell of the pipe. The rocks would keep the pipes at grade temporarily, and to the passing inspector it would appear as though the pipes were on a solid foundation. When the back-filling was begun the pipes were disturbed by the falling earth and rocks. In some cases scrapers are used for back-filling, and one can imagine how easily a pipe could be knocked out of grade, and the joints broken, when the contents of a scraper are dumped upon the pipe. Before using the scraper for back-filling, the pipe is covered with six or eight inches of dirt, just enough to prevent the falling rock breaking the pipe. When a sewer that has been constructed in such a manner fails to carry off the sewage as designed the people say that the engineer gave a poor grade, while in truth the grade was given correctly but the contractor did not conform to the grade given.

A number of the engineers and contractors of this city who had charge of the greater part of the construction of the sewers of Little Rock have been consulted and without an exception all stated that the sewers were constructed without the least regard to the subject of imperviousness of the sewer, and as one stated very forcibly, he cared only to keep the sewage in and not the water out. This was very plainly shown by another engineer who constructed a sewer in the bottom of the "Town Branch." The result of this neglect was that during the first heavy rain 150 feet of the pipe of this sewer was washed into the river. Too much emphasis cannot be laid on the desirability of making joints as tight as possible everywhere, and especially at the bottom, where the poorest jointing generally is found.

It appears that generally in the construction of some of the sewers of Little Rock the only object in view of those in charge was simply to lay the pipe so that it would meet the only test, which consisted of passing a wooden ball through the sewer. If the ball passed through the sewer, the work was considered all right, and then accepted by the engineer and commissioners. In some cases other tests were made by some few engineers of this city, and on account of these extra tests they have been called cranks by some of the contractors as well as other citizens.

Another error in the construction of this sewerage system was that the sewers were built without any provision for ventilation. The result is that at certain manholes the odor is so offensive that one is compelled to hurry by. At any time of the day this offensive sewer gas can be detected and the manhole is conspicuous by the green flies that swarm about same. As a general statement, all of the flush tanks are poorly constructed and are not water-tight. In a number of manholes the bottoms were built without any slope and consequently today they have three or four inches of sludge, instead of being clean and affording an unobstructed outlet for the sewage.

Heretofore when a contractor had finished backfilling the ditch it had the appearance of a small railroad embankment and it was almost impossible to drive over. A number of the contractors tunneled in the construction of the sewers whenever they were working in good soil and a cut of thirteen to sixteen feet. About four years ago a tunnel was made under one of the principal streets of the city, and today the street is showing the effects of that work, and will be in poor condition until fully settled. Besides the backfilling there is another objection to the manner in which the pipes are laid in the tunnels. At each end of the tunnel stakes were driven to

grade and a cord connecting the stakes was tied at the grade point on the stakes and the pipes were laid to the grade of the cord. It is a certain fact that there was slack in the cord and that the pipes were not laid to their proper grade. Besides this the engineer could not inspect the cementing of the pipes and the laborers could not do as good work in such a place as in an open ditch. They work in a very big hurry, as they have not much confidence in the contractor's ability to judge good earth for tunneling. The contractors claim the engineer objects to tunneling because he does not care to get in the tunnel, but is a known fact that none of the contractors of this city ever go into the tunnel and inspect their work, but stand up on the bank of the ditch and let the laborers take the risk.

At the last election a vote was taken on an amendment which if passed would allow the cities of the first and second class the right to issue bonds for public improvements. The fate of this bill is not yet known, but if carried Little Rock will construct a system of sewers that will be a credit to any city and will provide for the future growth of the city.

There is still another question: How will the city provide for sewers in the extreme southern part of the city, which is too low to use the present sewerage system. The property in this section is very valuable. A number of methods have been spoken of by different engineers and citizens. The writer advocates the use of the septic tank system, and believes that system will give the best results. There is a stream, known as Fourche, just south of the city, and this stream would serve as an outlet for the sewage after passing through the tanks.

Another method has been also spoken of favorably among some of the citizens, and that is to make a canal out of Fourche, but the cost of this would be very great.

The total cost of the present sewerage system is about $250,000, but if it were rebuilt the cost would not be so much and a better system would be constructed, as the city would profit by costly experience.

It has been the endeavor of the writer to give to the Society some idea of the size of the sewerage system of Little Rock, and the methods used in its construction. It is not the province of this paper to criticise in an unfriendly manner, nor to attack any one engineer or contractor of that city, but its purpose is to show to the Society just what kind of a sewerage system Little Rock has, and how it could have been bettered, and it is hoped that this paper will bring out some discussion by which that city can improve the present system, and furthermore, that some city contemplating the construction of a sewerage system will profit by the experience of Little Rock, Arkansas.

LOSSES IN UNDERGROUND STRUCTURES.

By Prof. A. P. Folwell, Lafayette College, Easton, Pa.

The author has recently completed the uncovering of some miles of water and gas pipe and replacing the pavement, and while doing so was again forcibly impressed by the enormous loss and inconvenience caused by ordinary municipal and corporate methods of constructing and managing street surface and sub-surface structures. While this is a matter of more or less common knowledge, it is one of the most serious unsolved problems confronting municipal engineers and boards of public works, and it is probably only the apparent hopelessness of remedying present conditions which causes them to be tolerated as they are. The sources of loss are herein considered separately, but possible remedies are considered for all of them taken collectively, for the reason that it seems probable that no remedy can be found for one or two only which will be effective even for those. In fact, the attempt to treat each by itself is probably the chief reason why no acceptable results have yet been obtained by water, sewer or street boards or commissioners in preventing these wastes; and one of the objects of this paper is to call to the attention of overseers of each class of improvement the interdependence of them all in this matter, with the hope that by co-operation a common satisfactory solution may be found to all of the difficulties in a considerable number of cases.

Most of the losses to be referred to can be classed under four heads: 1. The destruction of street paving by constant digging up of the streets. 2. The cost

of the digging itself and replacing the paving whenever the sub-structures must be got at. 3. The losses due to leakage of gas. 4. The loss of water by leakage. There are incidentally minor losses and inconveniences, such as the thawing of water mains and service pipes; the interference with traffic caused by excavations; difficulty of access to and ignorance of the exact location of service connections and other appurtenances; the great confusion of pipes so intricately placed beneath streets of large cities, etc.

1. Pavements. Secretary Tillson, in his work on "Street Pavements and Paving Materials," says: "It is almost impossible to repair any opening in a pavement so that it will be as good as before disturbance," and we all know this to be a fact. It is not that it is not done, but that it is not practicable. The remedy does not lie entirely in being more strict with those disturbing the pavements. No pavement is now in use which can be patched without causing humps or depressions which will diminish the serviceability and hasten the wear, and weak spots in the foundation causing after settlements are apt to be numerous. This undoubtedly results in a financial loss both in the pavement and to traffic, the former of which can best be expressed, perhaps, in terms of the shortening of the life of the pavement, but which it is difficult if not impossible to determine definitely. I believe most authorities would admit a reduction of at least 15 to 25 per cent in the serviceable life of each section patched. The loss to vehicles might be expressed as a negative gain from the improved paving; that is, if the pavement which has been torn up and replaced is but three-fourths as much an improvement on previous conditions as if it had been left intact, then one-fourth the cost of that improvement has been lost. If the pavement were found to last four-fifths as long as if undisturbed and meantime to have but three-fourths its full value as an improvement, then the disturbing of that pavement has caused a loss of 40 per cent. of its construction cost. The loss to vehicles may not extend over the entire surface when but one or two trenches are dug longitudinally, but the shortening of life does since the pavement must be renewed as a whole and not by patches. (Asphalt can be patched with better success than other pavements, but on the other hand the patching generally costs more.) I believe 30 per cent of the cost of city pavements would be a conservative estimate of the loss due to disturbing them—50 to 75 cents a square yard, or, say $2 to $4 a lineal foot. If this loss be distributed over the life of the pavement and this be assumed at sixteen years (on the basis of twenty years of life if undisturbed) we have 12.5 to 25 cents per year per foot as this loss.

As to the amount of such disturbance. In New York in 1896 one mile in four was torn up for construction purposes, and one opening requiring repairs for every forty feet of paved street. In Brooklyn, during the same year, one opening was made for every 75 feet of paved street. In Boston, in 1897, in about 500 miles of paved streets, there were 14,017 separate openings, about one to every 185 feet, with a total length of openings of 213.4 miles. In Chicago, in 1902, 20,200 permits were granted to tear up pavements, resulting in about 200,000 square yards of disturbance, or one opening to each 340 feet of street. Records of smaller cities are difficult to obtain, but with the spread of wire conduits and steam heating to small cities and towns (which already have sewers, water works and gas) all agree the destruction of pavements is increasing rather than decreasing.

2. Cost of Digging. This of course depends largely upon the size of hole necessary, but probably no opening costs less than $3 to $5 plus the cost of replacing the paving. This last will cost, if properly done, about as much as the original paving, even when most of the paving can be used again—say at least $1.50 per square yard for all pavements on a concrete base, and 50 cents for macadam. In Washington, D. C., the cost of taking up and replacing the paving for street openings during one year, on about 125 miles of streets (100 of which were asphalt and 10 asphalt block) was $47,594.83, or $380 per mile, or 7.25 cents per foot.

Assuming one opening, costing $4 for excavating and back-filling, for each 100 feet of street gives 4 cents per foot for this. Probably 8 to 13 cents a linear foot of the entire street surface would not be an excessive estimate of the cost of excavating, where the pavement is properly returned.

3. Gas Mains. It has been estimated that "in good practice the normal leakage of gas mains is 225,000 cubic feet per mile per annum for an average diameter of six inches. It is frequently twice that amount; in some instances it is three or four times as great. In American practice leakage ranges from 10 to 30 per cent of the output." (James C. Bayles, League of American Municipalities, 1902.) In 1898 353 plants reported to the United

States Commissioner of Labor a leakage of 7.3 to 14.7 per cent, 163 of these more than 14 per cent and all but 26 more than 11 per cent. If we assume that gas costs an average of 40 cents in the mains, and a leakage of 200,000 cubic feet per mile per year, this gives a loss of $80 per year per mile of main, or 1.5 cents per foot. Unfortunately, the greatest loss due to leakage of gas does not always fall upon the gas company, but is found in the destruction of asphalt pavements above such leaks; in many fires of "unknown origin" but attributed by insurance companies to gas leaking into cellars and basements from the ground (the freest outlet when street surfaces are sealed with concrete); in explosions and asphyxiation of workmen in sewers, a large part of the "sewer gas," to which this is attributed, being illuminating gas; and in the illness of individuals and shade trees.

Water Mains—Much has been written about waste of water by consumers; not so much about loss from the underground mains and service connections. Mr. Dexter Brackett reported to the Metropolitan Water Board (Boston and Vicinity) in 1904 that "the tests which have made in the several municipalities of the Metropolitan District tend to show that the leakage from the street mains and services is very large, and that from 10,000 to 15,000 gallons per mile of street mains escape each day into the ground or into some underground channel." In one town of this district 24,000 gallons per day was found to leak from 1,000 feet of main—a rate of 130,000 gallons per mile. Different authorities consider that an average of from 500 to 3,000 gallons of water leak from each mile of well laid main daily. Taking the average of poorly laid and well laid, probably 5,000 gallons is well under the actual amount in the average plant. At 5 cents per 1,000 gallon as the average cost of putting water into the mains this means a loss of $91 per year per mile per pipe, or 1.7 cents per foot.

For the sake of brevity few data have been introduced to substantiate the above statements and assumptions, but they are al based upon reliable reports and investigations, and probably any member of this society could find in his own city indications if not proofs that they are conservative.

These four losses as estimated above total of 22.5 to 45 cents per linear foot of street per year. This is of course a general average and some cities may be so fortunate as to suffer much less loss. But the author believes there are more in which these figures are exceeded in the business sections. There are the additional considerations of the annoyance from tearing up streets and from odors of gas and objections to water waste other than financial ones, and others previously mentioned.

Correction of each of these objectionable conditions without a radical change of the entire system of underground structures has probably progressed nearly as far as is practicable; but with more care joints of sewer, water and gas pipes, and the house service of each (in which much if not most of the leakage frequently is found) can be improved upon. For instance, a small box might be placed over every corporation cock and goose necks always used; tarred pipe could be rigidly excluded from gas mains, (the author has seen a great many tarred specials used on these). Also service connections could be run to the curb opposite every building lot from sewer, gas, water and heat mains just previous to repaving and at no other time. But there would still remain the tearing up of streets for laying new mains, for repairing leaks, thawing frozen pipes, etc.

The most serious loss, that in connection with the paving, can be somewhat lessened by having all tearing up, backfilling and repaving done by the city, at a fixed price with the corporations desiring the excavation should pay. It would not then be necessary to bring pressure upon and await the delays of the corporations responsible for remedying the faulty relaying of a pavement, but all paving and repairs would be under the immediate supervision of and attended to directly by one city department. This is probably the best solution of an undesirable state of affairs, and has been adopted by several cities. But even this does not give perfect repaving, since such is practically impossible, nor do away with the annoyance and cost.

The only solution which can be accepted as satisfactory will be one in which the paving will never need to be torn up until worn out; in which all pipes, wires, etc., can be laid without interfering with the paving and be readily inspected at any time, this being true of service pipes and wires as well as mains. The paving can be preserved by not permitting either private corporation or city departments to lay any mains under the streets, but compel them to purchase right of way along private property, or else reserve strips of public property—such as alleys or strips between the sidewalk and the street (the latter of which

would be interfered with by shade trees) —under which all such would be laid. But the other disadvantages are not remedied in this way. To meet them all a general conduit seems to be the only solution, with small branch conduits for the service lines. It seems probable that the model city of the future will have such conduits, throughout its business section at least, where pavements are most expensive and such structures most numerous. In them would be placed the small sewers of the separate system, water, gas and steam heating mains, while in the walls of hollow tile could be run the telegraph, telephone and other wires. St. Paul already has something similar to this in its sandstone sewer tunnels, as has Paris in its sewers. Nottingham and St. Helens, England, comparatively small cities, have had such conduits for several years. In Chicago 60 miles of tunnels for wires have been built, the trunk tunnels 12 2-3 by 14 feet, the branches 6.5 by 7 feet. If a private company can do this for its own wires only, it would seem to be still more practicable financially when all the above can be provided for. The advantage of such a conduit is not confined to the annual savings if the structures it contains can be originally laid in it, thus saving the excavating and repaving which would otherwise be necessary. This would amount to not less than 75 cents a foot for each structure, or $3 a foot for four—as sewer, water, gas and steam. (In the centers of the larger cities the number of various pipes, etc., would be several times this.) An electrical conduit in a business section costs $2 to $4 a foot or more (25 cents per duct foot on an average). Therefore even in a city of small size—say 25,000 to 50,000—the saving of $5 to $10 on construction would be effected. The loss of 22.5 to 45 cents per foot capitalized at 4 per cent would give $5.56 to $11.25 per foot; or a total of say $10.50 to $21.00 per foot. The conduit offers other advantages besides these financial ones, such as facility of inspection of all pipes, etc., and exact knowledge of the location and condition of each service connection. Also freedom from freezing of water mains, and ease of thawing if frozen.

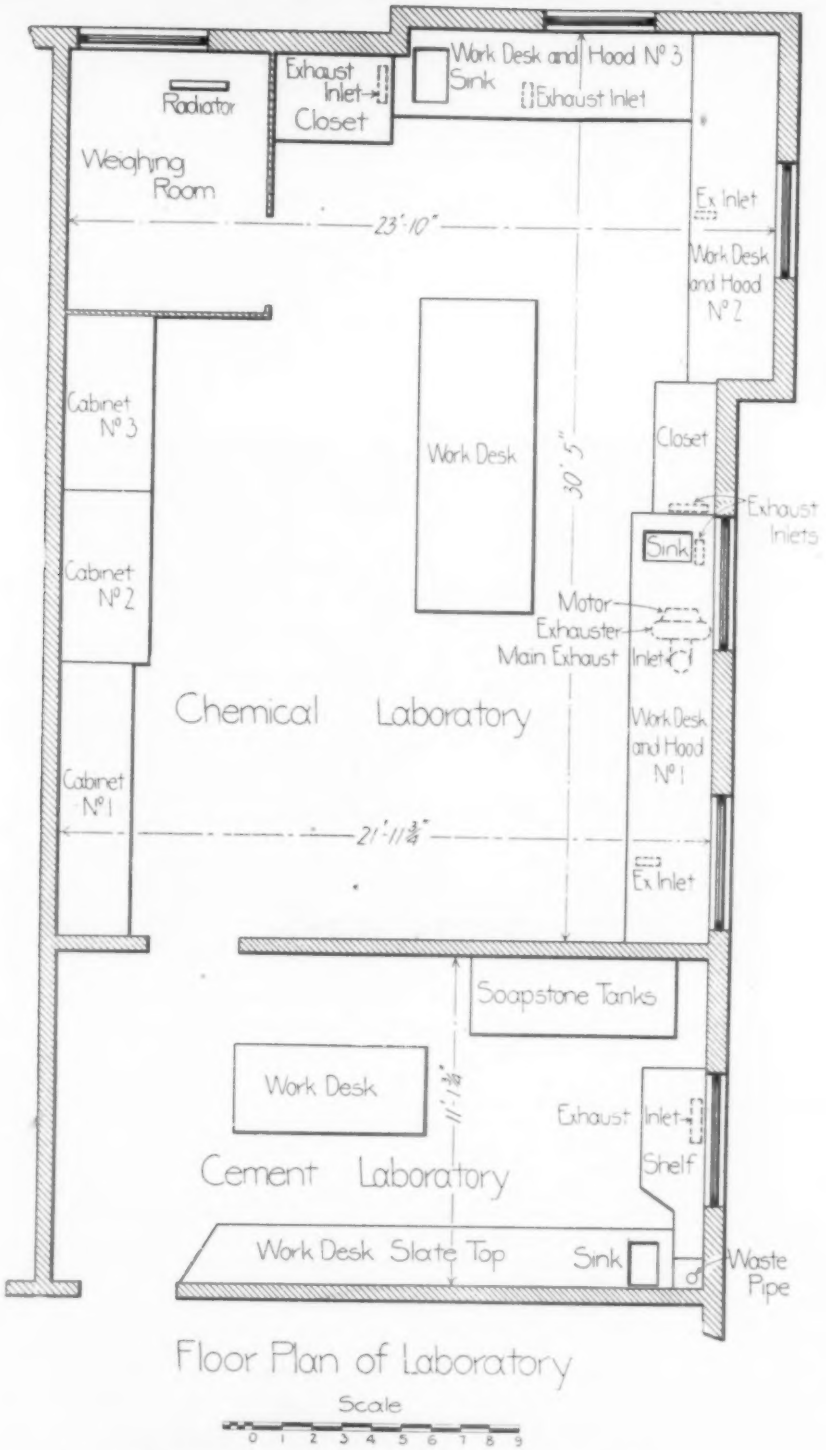
The weak point in this argument, and probably one of the principal reasons why more cities have not built these conduits, is that before they are really necessary several of the pipes have already been laid in different parts of the street, and instead of saving much of the cost of laying the use of the conduit requires the relaying of all of them, or of all but one, around which one the conduit may be built. But in spite of this it would seem as though some such contrivance is a necessity if we are to construct and maintain good paving, and that the time is coming when any city which can afford a brick, asphalt or modern wood block pavement must afford to first place under it a conduit which will preserve it from premature disfigurement, deterioration and renewal.

A MUNICIPAL LABORATORY FOR TESTING ASPHALT AND CEMENT.

By W. H. Brodhurst, Brooklyn, N. Y.

Inquiry is frequently made in regard to the proper construction, equipment, cost, and maintenance of a laboratory for testing paving materials, asphalts, cements, etc. Municipal officers, while appreciating the distinct advantages derived by laboratory control of public work, hesitate to establish such a plant without accurate data covering these points. It is therefore the purpose of the writer to describe briefly a plan for a Municipal Testing Laboratory, designed primarily for testing asphalts, asphalt pavements and hydraulic cements, and incidentally to include facilities for testing any material used on public work.

Some two years ago, the Department of Public Works of Brooklyn decided to enlarge its laboratory and equipment. This change was necessitated by the large amount of asphalt paving work planned for the years 1902 and 1903, some 1,300,000 square yards, which was duly contracted for and laid under laboratory control. In planning the construction of the laboratory, we were limited only by the amount of space. A corner room 22 ft. by 40 ft., situated on the top floor of the municipal building, and having windows on the east and south sides, was selected as best suited for laboratory purposes. The room was also provided with a large skylight, a very desirable adjunct for scientific work. Plans and specifications were prepared for the installation and erection of the necessary fixtures,



MUNICIPAL TESTING LABORATORY, BROOKLYN, N. Y.

Plan showing location of apparatus in cement and asphalt laboratories.

cabinets, work-desks, etc., the relative positions of which are shown on the accompanying diagram. Cement testing necessarily creates considerable dust. Dust is inimical to accuracy in chemical analysis, hence these two classes of work should be separated as completely as possible. The room was therefore divided by a plaster partition wall with connecting door, into a cement laboratory and a chemical laboratory.

The cement laboratory was provided with three briquette immersion tanks, a moist-closet in which to keep briquettes in moist air before placing them in water, a slate-top work-desk running the entire length of one side of the room, and a central work-desk covered with plate glass on which to mould briquettes. A device for carrying off dust, incident to sieving cement, was also provided for. It consists of a galvanized iron hood connected to an exhaust draught by a central flue. The briquette immersion tanks have been especially satisfactory. They consist of three rectangular tanks of 1¼ in. soapstone, 7 ft. by 2½ ft. by 7 in. deep (outside measurement), having a capacity of 800 briquettes each. The tanks are placed one above the other, 1 ft. 3 in. apart supported on a wrought-iron framework. They are each supplied with running water, having a supply pipe at one end and an overflow outlet at the other, the flow of water being regulated independently for each tank by a series of Jenkins's globe valves. The equipment includes a Fairbanks cement tester, a Riehle 2,000-lb. cement tester with worm gear, and a general run of cement testing apparatus and accessories. Tests for tensile strength, fineness, time of set, and soundness, are carried on from day to day, and more occasionally, analyses are made of doubtful samples. Ten thousand briquettes were tested in 1902, and twenty-seven thousand briquettes were tested in 1903. The photograph of the cement laboratory shows the arrangement of the apparatus named.

In the chemical laboratory, work-desk cabinets, closets and apparatus cabinets were placed along the entire perimeter of the room. Three slate-top work-desks, 2 ft. 10 in. in width, each provided with a glass-framed hood, 7 ft. high, were erected along the south and east walls. The hoods were provided with sliding windows, operated by Pullman spring-balances to economize space, thus avoiding cumbersome pulley-weights. Each work-desk was provided with a slate backing, carrying water, gas and waste-pipe connections along its entire length. Sinks counter sunk in the slate top, were provided at the left end of each work-desk. At the northeast corner of the room, a space 7 ft.x9 ft.x10½ ft. high, was partitioned off with glass-frame partitions as a weighing room. This room being small,

CEMENT TESTING LABORATORY, BROOKLYN, N. Y.

View of one end showing work tables, sieving hood and briquette storage tanks.

the temperature may be readily controlled. It is therefore well adapted also for use in making penetration tests on samples of asphaltic cement. In the remainder of the space along the north side of the room, three large cabinets were placed. These cabinets are 12 ft. in hight and 2 ft. 6 in. in width, divided into upper, middle and lower compartments, and furnished with ample shelving and drawers for storing apparatus and samples. A sliding ladder attached to a track on the upper part of the cabinets, gives convenient access to each. A large work-desk, 10 ft. x4 ft., occupies the center of the room.

ASPHALT TESTING LABORATORY, BROOKLYN, N. Y.
View of upper right-hand corner shown in plan.

With the experience gained in previous years, we were prepared to install in the chemical laboratory some necessary, though novel, features. The analysis of asphalts and asphalt pavements requires the use of a considerable amount of bisulphide of carbon, an ill-smelling liquid which evaporates quickly when exposed to the air, forming a gas which is exceedingly injurious to inhale. This gaseous bisulphide of carbon is also very inflammable and therefore dangerous to have in proximity to gas burners or gas stoves commonly employed for heating purposes in chemical operations. We therefore decided, first, to do away with the flames and employ electric heating devices only, and, secondly, to remove the vapor of bisulphide of carbon as soon as generated, by a system of artificial ventilation, i. e., by sucking the air continuously from each hood by means of an exhaust fan connected to a central flue, or more properly, a rectangular sheet-iron duct, cross-section 20 in. by 5 in., running beneath the floor under the hooded work-desks, connection being made with each hood by valved off-sets from the main duct. In this way, each hood and work-desk is connected with the exhaust, all smoke, fumes, gases and odors generated being quickly removed and a current of pure air supplied to each hood. The main duct was of course installed before the cabinets were erected. It is to be noted that the windows in proximity to the exhaust outlet are kept closed, the intake of air coming through a ventilator in the roof. A No. 4 Sturtevant exhauster with bottom horizontal discharge is used on this system, the discharge passing through a circular opening in the wall. The exhauster is operated by a 1 H. P. electric motor, direct connected, and controlled by a speed-regulating rheostat.

For the electric heating apparatus, four (4) twelve-ampere outlets were provided on a 230-volt circuit, independent of that used for lighting. The outlets were located at convenient points along the wall at the back of the hooded work-desks, and were connected with plug-switch receptacles which covered them. The electric heating apparatus was fur-

nished by the Simplex Electric Co. of Cambridgeport, Mass. The electric heating devices installed include three immersion-coil steam baths for evaporations, distillations, etc.; two flat-surface stoves, one electric oven for obtaining constant and uniform temperatures up to 500 degrees F., and one controlling rheostat. Each of these instruments provides for three heats, high, medium and low, and the heat may still further be controlled by throwing a rheostat in circuit. The electric oven is particularly well adapted for the determination of the volatile matter in asphalts and oils, as the heat is radiated from iron plates in which the resistance wires are imbedded, thus insuring a uniform heat throughout the oven, a most desirable condition for this class of work. The use of the electric current has the added advantage that the heat may be more readily controlled than by any other method. The chemical laboratory was equipped with an analytical balance, a balance for heavy weighings, a Bowen penetration machine and a Dow penetration machine. If it be desired to adopt the centrifugal method of sedimentation a centrifugal machine will be required. The photograph of one corner of the chemical laboratory shows specimens of the apparatus and the methods of installation.

The specifications for the construction of the laboratory required all materials to be of the best quality of their several kinds. All woodwork was of clear white pine. The carpentry work, plumbing and sheetiron work was let in one contract to the lowest bidder for $2,745.

The total expense may be itemized as follows:

Carpentry work, plumbing and sheet iron work	$2,745
Electric wiring, switchboard, etc.	135
Electric heating apparatus	169
Exhauster, motor and rheostat	165
Cement testing apparatus	600
Chemical apparatus	1,500
Total	$5,305

It is to be understood that a laboratory of similar description may be established and operated for very much less than the above figure, but to equip such a plant with every facility the above figures are correct. The maintenance for the second year was $750, and for the current year we expect this item to be somewhat reduced.

The procedure adopted in the Chemical Laboratory for controlling asphalt paving work is as follows: Samples of the asphalt mixture are taken from day to day as the material is brought on the street, and tested for percentage of bitumen soluble in bisulphide of carbon, and the percentages of sand and mineral dust retained by a series of sieves of different mesh are regularly determined. The percentage of bitumen soluble in standard naptha is determined on irregular and defective samples. Penetration tests on samples of asphaltic cement, and complete analyses of samples of refined asphalt, flux, and asphaltic cement are made periodically, the samples being taken from the material in current use at the contractor's plant.

Supplementary to the laboratory routine, an important part of the work consists of the inspection of asphalt plants by the chemist. If the analysis shows that any discrepancy exists in the mixture, an immediate inspection of the plant is made to determine and locate the cause of the trouble, the methods of mixing being noted, weights checked and percentages calculated. Even though a correctly proportioned formula has been adopted, a defective mixture may result from such causes as the use of overheated sand, the introduction of sediment from the bottom of the tank into the mixture, the use of damp limestone dust, or from the addition of short weight of asphaltic cement, resulting from the fact that a considerable amount of asphalt cement which has become chilled on standing, due to delay or interruption of the work, clings to the sides of the bucket when dumped. These errors result from carelessness or lack of knowledge and though unintentional as a rule, result nevertheless in producing an irregular composition, which seriously impairs the life of the pavement. The fact that such irregularities occur with the most experienced contractors, emphasizes the necessity for frequent analyses and prompt inspection.

THE BITULITHIC PAVEMENT.

By Fred. J. Warren, Boston, Mass.

We are not ordinarily inclined to appreciate the tremendous advances which have been made in road building durmg the past century. When we drive over, and observe the many advantageous features of macadam, brick, asphalt or the wood block pavement, we do not appreciate that such roads were not available at all at the beginning of the last century and that the entire development in road building started in as late as 1816 with the introduction of the macadam road by the eminent English engineer John McAdam.

It is, I think, generally conceded that a dirt road, when in perfect condition when neither too dry nor too wet, is the ideal road for pleasure driving, and that the macadam pavement affords some of the advantages of the dirt road and overcomes many of its disadvantages, and is the most generally used street of the present day throughout all sections of the world. Stone block, asphalt, brick and wood all have some advantages not possessed by the macadam and other disadvantages. No pavement is ideal and the public never has, and probably never will believe that any pavement is perfect.

In the bitulithic pavement the effort was made to retain the advantages of the macadam pavement to the greatest possible extent; retain all of its good features and overcome so far as possible the tremendous tendency to ravel and wash and grind under traffic. The method of accomplishing this end has been fully explained in previous papers before this and other societies, and it is encouraging to the originators of the idea that the public has accepted the pavement as an advance in the right direction. Briefly, the fundamental principles in the construction are that the sub-foundation shall be thoroughly rolled with heavier rollers than are ordinarily used in roadway construction and that the foundation shall be equally well-compacted by rolling. The hardest available stone should be used in the wearing surface and the stone after being crushed should be used in predetermined proportions. By using crushed stone in predetermined proportions and binding it together with a scientifically prepared bituminous cement, great durability can be accomplished, and at the same time there will be retained to the wearing surface the advantages of a first-class macadam road, and overcome many of the disadvantages of other pavements. The laying of a few sample pavements of this class in 1901 attracted considerable attention and the following table indicates the development which has taken place since that time:

STATISTICS OF LAYING OF BITULITHIC PAVEMENT.

Year.	No. cities.	Total area sq. yds.	Average area per city sq. yds.
1901	7	16,400	2,343
1902	33	365,932	11,090
1903	40	800,071	20,000
To Sept. 1, 1904	47	1,222,435	26,009

The advantages of the pavement may be best set forth by quoting from the report of a committee from the city of Cincinnati which recently investigated a large number of pavements through New York and New England.

The chief features to commend this pavement are:

1. Its freedom from mud and dust. The surface can be sprinkled, swept and kept entirely free from dust. If free from dust, and no attrition of the surface taking place, rain cannot produce mud.

2. Absence of any slippery surface. When wet the surface seems just as good holding as the surface of a new macadam road. There could be no side slip for bicycles or "skidding" of automobiles on this pavement. This eliminates a very dangerous condition, which is the frequent cause of accidents on some other forms of pavement. Wet rubber tires get a good grip on the surface.

3. No evidence of cracking. From the ductility of the surface and manner of construction, it would seem very unlikely the surface could crack or break up.

4. Durability. The streets inspected showed no evidence whatever of wear, washing out or breaking up. From the manner of construction it would be fair to suppose the durability is all that could be desired.

5. Although the pavement is firm and non-wearing, it is not at all a "dead" surface. Horses travel freely and comfortably over it. There is a sufficient

yield to the surface to prevent any injury to the hoofs or tendons of horses habitually using the pavement. Rubber tires travel quickly over it. It is a comfortable pavement to use for any kind of vehicles. Your committee had the pleasure of traveling in one day over 100 miles in autos over the larger part of this kind of pavement.

6. The surface affording a good foothold for horses, and "lively," makes the traction of heavy loads considerably easier for horses. Rubber tires, securing a grip on the slightly roughened surface, allow all power in any automobile to be used for propulsion, as is also the case with bicycles.

7. The surface can be swept and kept perfectly clean, and at any time it can

FRED. J. WARREN, BOSTON, MASS.
President Warren Brothers Company.

be flooded and washed without any inconvenience. Being waterproof, noxious substances thrown on the pavement cannot be absorbed.

8. The color of the surface is a dull gray, very restful and pleasant to the eye, and not at all likely to radiate heat. It presents a well-finished, well-kept appearance.

9. No crosswalks are needed. The street being free from mud and dust, the pavement is suitable for the pedestrians as well as for any form of locomotion.

10. Simplicity of construction. The pavement can be laid from curb to curb without the use of gutter stones. No "toothings" along the car rails are necessary. The pavement is laid flush with the improved grooved car rails. No headers are used at its junction with any other form of pavement, but headers can be used where car rails are laid in streets if it is deemed advisable by the engineer.

11. The street is easy to repair. In case of street opening being necessary, the pavement is easily removed and replaced, and if properly rolled very little evidence of replacement is left.

12. It's noiseless. Horses' hoofs make but very little sound on the pavement, vehicular traffic none at all, unless from the nature of the load.

13. It can be laid over the ordinary macadam road or any other pavement, after the usual preparation and change. It can be quickly laid in sections, and is at once ready for use, entailing very little interference with traffic conditions.

14. Cost. This compares favorably with any of the pavements now being used in our city, and we believe is very much less than has been paid heretofore for some of the pavements now in use.

The construction of the pavement seems very simple and even the originator of it did not realize at the start all of the possible causes of defects and the care which was necessary to avoid them. Having considerable experience, however, in the manufacture and handling of bituminous materials, we recognized that we were overcoming a great many of the causes of defects which generally existed in bituminous pavements. The mixing of stone in predetermined proportions does not necessarily give a good wearing surface, for the proportions might be erroneously combined. For example, if wrong proportions of the various sizes are used, some of the intermediate sizes may act as the basis for a fulcrum and a lever when the bitumen is most flexible in the hotter days of summer, and the heaviest teams might cause a slight movement of the stone which would permit water and dirt to ooze in between the stone particles and give a starting point for future defects. Again, if the mixture is perfectly combined and through carelessness in workmanship is improperly compressed, the same or similar defects might occur. The above defects have been very few in the work which has been constructed because it has been realized by those engaged in the industry that the greatest care should be exercised in the selection of the materials and the construction of the pavement. Other defects could very readily occur from carelessness in the selection of the stone and the use of stone which will grind unduly or pulverize under traffic. It is generally understood that on top of the concrete structure which is mixed in predetermined proportions there is used a quick drying flush coat for the purpose of sealing the surface and pro-

tecting it pending the time the pavement becomes more solid from the compression which comes from traffic, and for the purpose of holding the gritty surface of stone chips. The careless use of flush coat composition has in some cases been a source of annoyance although it has never affected the durability of the pavement. In laying the pavement in cold weather particularly, there is a tendency for the flush coat to chill and it requires promptness to prevent too large a quantity being left on the surface.

Again, if the flush coat is not covered over with hot stone chips it may chill and the chips in some cases do not unite with the flush coat. This is a cause of annoyance in the early spring when the flush coat becomes softened by the heat, but can easily be rectified by the rolling of additional stone chips into the surface. This class of defect occurred to a very small extent on the work done late last fall, but in several cases during the preceding year. Of course the experience which comes from the actual construction of the pavement and a recognition of these possible defects make it possible to overcome them in the future, but it has been difficult to organize and educate a large number of men who are engaged in the industry in various sections of the country to get that perfection of construction which is possible only through experience. We desire that the cities themselves should recognize these possible causes and through their engineers, officials and inspectors should aid by insisting on the work being done in a thorough manner. In the experience we have had up to date we have encountered no serious causes of error which can not be easily overcome, and we have overcome the errors of previous years to such an extent that, with the exception of one street, which involved an expense of some $2,200, where a large body of the mixture was burned through gross carelessness of the foreman and superintendent, which was not detected until the samples reached our laboratory, the entire expense of maintenance through the various cities of the United States, where the pavement has been built has not this year exceeded $800 on all the work done prior to 1904, and this expense covers all of the many miles of work done by Warren Bros. Co. as direct contractors. It should be borne in mind that some of these pavements are now in their fourth year and that the aggregate quality of bitulithic pavement in use exceeds 160 miles of thirty-foot roadway.

Massachusetts has the reputation of having the best roadways of any section of the United States, and I think she is entitled to this reputation. Boston has been the company's headquarters and naturally more attention has been given to the development in that section than anywhere else. The demand in the State of Massachusetts has been such that the pavement has been laid in sixteen cities and during the present year the amount of bitulithic laid in the State equals half the entire amount of asphalt paving in use in the State, and we have laid this year more than seven times as much bitulithic as the entire amount of asphalt laid in the State during the year. The pavement is available on account of its non-slipperiness of surface, for a large number of side hill streets where asphalt would be eminently unsuitable, and we believe it is generally recognized among the thoughtful road builders that in the construction of the bitulithic pavement we have overcome the principal causes of failure of asphalt, which come from lack of inherent stability of the sand used in the asphalt structure and from the well-known effect of water in disintegrating natural asphalt.

The strongest point of the bituminous cement used in the bitulithic pavement is the fact that it is absolutely unaffected by water. This is due to the fact that the material is converted to a gas and in the gaseous state is purified by water, removing all matter soluble in water, and the refined material is not chemically acted upon by water either in light or darkness, while practically all of the natural asphalts are seriously affected by water. The free carbon which is converted from a bitumen while in the gaseous state takes the form of a flake with cells and when used in proper proportions in the bitumen adds very greatly to its life. The weakest point of a coal tar cement is that it is evaporated at low temperatures and if the carbon is used in insufficient quantities the life of the cement is greatly decreased, while if the carbon is used to excess it deadens the cement and destroys a considerable part of its binding qualities. It takes a great deal of care to manipulate the material and a knowledge drawn from experience of just what is required, but it is an entirely practical matter to get uniformity.

One of the strongest points of the pavement is the inherent stability imparted to the mixture by the proper grading of the stony elements, thus permitting the use of a softer cement with a lower melting point, and one which has less tendency to

be deteriorated in process of mixing. This strong point becomes a source of weakness if the materials are not properly handled, for where we depend upon the inherent stability of the stone for a part of the strength and use a softer cement on this account, if the stone is not properly graded the cement may not give sufficient binding property to sustain the load under heavy traffic. This is easily provided against by care in the preparation of the mixture but it would be absolute folly to assume that the principal advantageous features of the bitulithic pavement could be secured without separating the material into a number of sizes and using them carefully and intelligently in predetermined proportions.

CONCRETE PAVEMENTS IN TORONTO, CANADA.

By C. H. Rust, City Engineer.

The following brief account of the construction of concrete pavements in Toronto may be of some interest to the members of the society:

The first concrete pavement was laid in Toronto in 1899 on the track allowance on King-st. The asphalt pavement between the tracks on this street being

C. H. RUST,
City Engineer, Toronto, Ont.

worn out, it was decided to remove 2½ inches of the material and 3 inches of the concrete foundation to permit of scoria brick blocks being laid, but owing to the excessive cost and the labor involved in cutting the concrete foundation, it was afterward decided to lay a surface of concrete 2½ to 3 inches in thickness, somewhat similar to that used in the construction of sidewalks, a joint being left every 6 feet.

The concrete was composed of one part of cement, one-half part of sand and two parts of crushed granite. The cost was from 65 to 75 cents per square yard and the work was carried out by the City Engineer's Department. Next to each rail was placed a row of paving blocks laid as stretchers. Owing to the very large amount of traffic, this pavement has not proved entirely successful and had to be repaired in 1902. The pavement cracked near the rails and the constant traffic broke up the surface. This disintegration was probably due, to some extent, to the settlement of the rails.

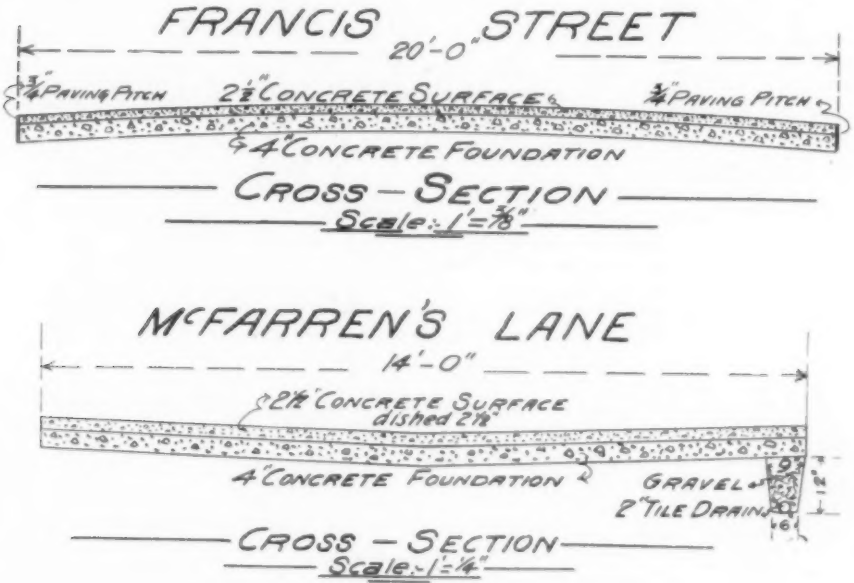
A similar pavement was constructed in 1900 upon the Sherbourne-st. track allowance. This is a residential street, and the pavement has given good satisfaction, showing no signs of wear.

Bloor-st. track allowance was also paved with concrete the following year and is in good condition. The former pavement upon both Sherbourne and Jarvis-sts. was asphalt, and it was to avoid breaking up the concrete foundation that a surface coating of concrete was used.

Francis-st., which is a short thoroughfare subjected to a great deal of trucking, was paved with concrete in 1903, the foundation being composed of one part of Portland cement, three parts of sand and seven parts of broken stone, which is a similar foundation to that used for asphalt or brick pavements. Before the foundation had time to set, a 2½-inch surface of what is called granolithic concrete was put on. This forms the wearing surface and consists of one part of cement, one part of sand and three parts of crushed granite, and is marked off in blocks 3 inches by 12 inches, which gives it somewhat the appearance of a scoria block pavement. Concrete walks, with curb, were laid on this street previous to the concrete pavement, and expansion joints were therefore provided throughout the entire width of the pavement by

leaving an opening one inch wide along each curb, paving pitch being run into it until the opening was completely filled. Longitudinal expansion joints were also provided by leaving an opening three-quarters of an inch wide through the pavement, the space being filled with pitch. It would have been better to have made the longitudinal expansion joints upon McFarren's-lane, but it was dished to the center. This street is not sub-subjected to as heavy traffic as Francis-st. It cost $1.92 per sq. yd., the work being done by the City Engineer's Department. Attached to this paper is a cross-section of Francis-st. and McFarren's-lane.

The concrete pavement has not been



CONCRETE PAVEMENTS IN TORONTO, ONT.

only one-half inch wide, as it is noticed that heavy traffic has a slight tendency to break away the concrete pavement at these points. With this exception, the pavement is in very good condition, no cracks being visible. The cost of this pavement was $1.74 per sq. yd., the work being carried out by the City Engineer's Department.

A similar pavement was laid this year constructed in Toronto for a sufficient length of time to enable the writer to form an opinion upon its wearing qualities. Teamsters, and others using the pavement, appear to like it, as it affords a fairly good foothold for horses. It is also cheap and easily cleaned and if the wearing surface will last, it will be a much cheaper and better pavement than stone blocks.

TESTS FOR WOOD PAVING BLOCKS.

By F. A. Kummer, C. E., New York City.

In approaching this question it should perhaps be borne in mind that, provided a standard quality of lumber is called for, it is not possible for the manufacturer to make any considerable variation between one block and another. They are unlike, let us say vitrified paving brick, in this respect, where bricks from one portion of the kiln are hard and from another portion soft, and where the question of inspection and culling determines the quality of the material and where even a single carload may vary fifty or one hundred per cent within itself. Wood paving block, when treated, must, through the nature of the treatment itself, be all

treated alike in any one individual charge and these charges usually run from 300 to 400 square yards of pavement at a time, so that it is a question of determining whether the particular process to which the block are subjected is a desirable process and whether it is being carried out.

The question of determining the quality of lumber of which blocks are made can be done at the plant when the blocks are being manufactured, or can fairly well be done after the block are received on the work by simple inspection. The question also of whether the treatment is carried out to the requirements of the specifications may be readily determined by inspection at the plant, or more easily in the case of specifications requiring complete impregnation of the wood, by the simple expedient of either splitting individual blocks open to see whether the treatment extends to the heart, or by placing them in water to determine whether they will sink or float, it being a well known fact that blocks thoroughly treated throughout with creosote or a creosote mixture will sink in water. If half a dozen samples from different parts of a boat or car load pass this test, it is practically certain that the cargo as a whole is equally well treated.

The following specification for wood paving block is one prepared by Mr. George W. Tillson for work of this class in the Borough of Brooklyn, City of New York:

1. The wearing surface shall be composed of long leaf, all heart, yellow pine blocks, treated as hereinafter described. All blocks shall be of sound timber, free from bark, sapwood, loose or rotten knots or other defects which shall be detrimental to the life of the block or interfere with its laying. No second-growth timber will be allowed.

2. The blocks are to be treated throughout with an antiseptic and waterproof mixture, at least 50 per cent of which shall be dead oil of coal tar, commonly known as creosote oil. The remainder to be resin or some other similar and suitable waterproof material. All portions of each individual block shall be thoroughly treated with the mixture and after treatment the specific gravity of the blocks shall be greater than that of water.

3. After treatment the blocks shall show such waterproof qualities that, after being dried in an oven at a temperature of 100 degrees for a period of twenty-four hours, weighed and then immersed in clear water for a period of twenty-four hours and weighed, the gain in weight shall not be greater than 3 per cent.

Taking up these specifications in detail, you will see that the first clause refers to the quality of the lumber, a matter which can be determined, as before stated, by careful inspection.

The second clause deals with the nature of the treatment itself. The writer has seen specifications in which at least a page of typewritten matter is devoted to the tests which the creosote oil to be used in treating the blocks shall pass. As a matter of fact it is perfectly well known to all manufacturers of treated timber that the amount of antiseptic material contained in ordinary dead oil of coal tar is sufficient to prevent decay of the wood if diffused throughout its mass, provided the oil is retained in the wood in its full strength and efficiency.

The State railroads of Germany originally used oils containing a high percentage of napthaline, the supposed chief function of which is to solidify in the pores of the wood and prevent the evaporation of the tar acids and other antiseptic parts of the compound. Some years ago the practice of the German distillers of coal tar changed and they began to produce an oil containing very little napthaline, owing to the sudden extensive use of the latter in the manufacture of artificial indigo. About that time the manufacturer, who treated practically all the ties for the State railroads, gave a dinner to the railway officials and announced, as a result of a series of tests, that oils with very little napthaline and a very high percentage of tar acids, carbonate, etc., were the most desirable for wood preserving purposes, whereupon the State specifications were changed, and such has been the practice of the German State railroads since then. The United States government, on the other hand, has always insisted on high percentages of napthaline, as in the practice in England, but it has not been found to be the case that the results with timber treated by the two different methods are very different, although the writer believes that where straight creosote is used the napthaline is a desirable ingredient. Its analysis will depend very largely upon the particular works from which it comes, some oils running 40 per cent in napthaline, some as low as 20, but all of these oils, as before stated,

are sufficiently antiseptic in their nature to prevent decay in wood if they are properly retained in it. For this reason the Brooklyn specification does not provide for any tests for the creosote oil itself. The strong point of the specification quoted above is its demand for results, and to secure these the manufacturer is required to incorporate with his creosote oil some waterproof material which will perform the double purpose of retaining the creosote oil in the wood and of keeping the water out. As soon as a block begins to absorb water, not only is it in danger of swelling and destroying the surface of the pavement, but by becoming soft and spongy it wears much more rapidly than a block that is waterproof. The very simple expedient is therefore adopted of making an absorption test, the limits of same being 3 per cent ofter 24 hours drying and 24 hours' soaking in water, a limit smaller than that generally adopted with vitrified brick, and one which means practically no absorption at all. The writer is informed that tests conducted on such blocks in the Borough of Brooklyn last year showed an absorption of less than 1 per cent, these blocks being taken from blocks delivered on the street and being fairly representative of the quality of the shipment.

These physical tests cover almost, but not quite, the entire ground. Let us suppose, for instance, that one block is treated with a mixture of creosote oil and rosin. On the other hand, let us suppose that a manufacturer were to produce a block treated with a mixture of dead oil of coal tar and some such waterproof material as paraffin or bitumen. It is possible that these blocks would also pass the above specification. The first block would be a great deal harder than the original wood, because the solidification of the rosin in the pores of the wood has been shown by actual tests extending over years to very materially harden the fibers of the wood and increase its resistance to abrasion, and this is a very important requirement in paving block, especially where it is subject to heavy travel. Some other waterproof material might be used, which would not harden the wood at all and therefore there would exist between the two blocks a very material difference in their ability to stand heavy traffic. We are therefore brought to the question whether in the case of wood block, as in the case of vitrified brick, some form of abrasion test cannot be utilized which will determine the hardness of the material as well as its resistance to moisture. The ordinary rattler test for brick would be valueless in such a case, if for no other reason because the two faces of the block are the only portions of it which are calculated to stand heavy wear, the four sides being totally deficient in this respect because the fibres of the wood are not presented at right angles to the action of travel.

The writer read a paper before the American Society for Testing Materials on this subject at their annual convention at Atlantic City last June, and a series of tests were suggested which might record the amount of pressure required to force a die of a given size into the end fibers of the wood for a constant depth, the block being tightly held in place by suitable clamps, but as yet no results of testing by this method have been secured. At this convention it was suggested to the writer by Mr. Logan W. Page, Chief, Division of Tests, Bureau of Chemistry, Washington, D. C., that a series of tests might be conducted on paving blocks by means of the Dore machine, now installed in the laboratory for testing road materials at Washington, which machine consists roughly of a horizontal plate revolving against the face of the block to be tested under given pressures, sand being fed upon the plate so as to produce a uniform and regular abrasion of the surface of the test piece. The writer is having tested by Mr. Page some blocks treated with straight creosote alone, and with a mixture of creosote and rosin; also some untreated blocks. For purposes of comparison only, and with no hope of securing results having any absolute, but merely relative values, the writer has had a series of rattler tests made with the following results:

Six blocks of each kind were tested, the size in each case being 3x3½x8. Tests were made upon untreated Georgia pine block, block treated with creosote oil and block treated by the creo-resinate process. The rattler used was a 36-inch foundry rattler four feet long and 100 pounds of iron castings were placed inside along with six blocks. The rattler was revolved at about fifteen revolutions per minute for two hours in each instance. Results were as follows:

Untreated Blocks—Weight of six blocks before testing, 12 lbs. and 2 oz.; weight of six blocks after testing, 11 lbs. and 11 oz. Loss 7 oz., 4.8 per cent.

Creosoted Blocks—Weight of six blocks

before testing, 16 lbs., 1 oz.; weight of six blocks after testing, 15 lbs. 11 oz. Loss 6 oz., 3.1 per cent.

Creo-resinate Blocks—Weight of six blocks before testing, 17 lbs. 15 oz.; weight of six blocks after testing, 17 lbs, 9⅞ oz. Loss, 5⅛ oz., 2.5 per cent.

The writer does not believe that these tests have any particular value except as indicating a certain relation between untreated and treated blocks. It would be impossible to recommend the rattler test for paving blocks as a method of testing. The writer hopes that the results upon the Dore machine in Washington will be more conclusive and that before the society meets again some means will have been arrived at for determining the relative resistance of blocks treated in different ways, not only to moisture, but also their relative resistance to abrasion. Such a determination will, it is believed, ultimately become necessary in any comprehensive system of testing paving blocks.

THE MUNICIPAL ASPHALT PLANT AT WINNIPEG, MAN.*

By H. N. Ruttan, City Engineer.

The Municipal asphalt plant was established in Winnipeg, Manitoba, in 1899, at a cost of approximately $14,000. The capital account for 1899 and 1900 is shown in Municipal Engineering, vol. xxii, p. 176, and for 1902 in vol. xxv, p. 383; that for 1903 is as follows:

Balance from 1902	$17,398.97
New steam hoist, engine, etc	1,150.38
Half cost of tools	236.11
Half cost of extensions and repairs	2,296.63
Total	$21,082.09
Depreciation at 5 per cent	1,054.10
Value of plant, 1904	$20,027.99

The annual charges for maintenance and operation for 1899 to 1902 are shown in vol. xxv, p. 383: those for 1903 are as follows:

Maintenance and repairs	$2,296.62
Half cost of tools	236.12
Interest at 4 per cent on $21,082	843.28
Depreciation at 5 per cent	1,054.10
Lost taxes	100.00
Total cost	$4,530.12

The asphalt yardage in 1903 being 65,381, this makes the plant charge for that year 6.93 cents per square yard.

The following information is additional to that given in the two articles above referred to:

The city is on a practically level prairie about seven feet above extreme high water in the streams and thirty-three feet above low water. The climate is sometimes extremely hot in summer and in winter the thermometer reaches the forties below zero. The snowfall is light, pavements, especially street car tracks, being almost, or quite, bare all winter. These conditions are particularly unfavorable for asphalt pavements, but with one or two exceptions they show very few cracks. Broken stone is used for drains because tile above the frost line is destroyed by ice. Frost penetrates the soil six or eight feet and cracks, sometimes six inches in width open on the surface. It has not been found that any of these cracks show through the asphalt. Three inches of sand and gravel on top of the clay foundation prevents the concrete from adhering to the clay and being cracked or pulled apart when frost cracks open in the latter. The cost of materials f. o. b. cars in Winnipeg in 1904 is as follows:

Portland cement per 100 lbs	$ .74
Broken stone per cu. yd	1.30
Sand and gravel, average about	1.00
Crushed granite per cu. yd	5.00
Asphalt per ton	26.37
Maltha per imperial gallon	.12

The average cost per square yard of pavement laid is as follows:

Grading per sq. yd (including cross drains)	$ .15
Sand foundation	.15
Concrete, 4½ inches	.65
Binder	.28
Surface	.60
Plant charges	.05
	$1.88
Maintenance fund	.20
	$2.08
Engineering and collection, 10 per cent	.20
Total cost	$2.28

In residence districts the city contributes out of the general funds half the cost of a 24-foot macadam pavement and the property the balance, this having

* From a paper before the American Society of Municipal Improvements.

been adopted some years ago as the standard. On a few business and leading thoroughfares the city contributes one-third of the total cost. The street railway company pays for eight feet width if single track or seventeen feet if double track. Twenty year bonds are issued for original cost of pavements, the interest and sinking fund charge being collected each year. Of the maintenance fund provided very little has so far been expended. It now amounts to $52,714.41, being 20 cents per square yard laid less about $1,125 expended in 1900, 1901, 1902 and 1903 for repairs, the amount for the last year being $589.10.

Common labor costs 20 to 25 cents an hour for nine-hour day and more expert men 30 cents an hour to $2.75 a day, $8 for the superintending chemist and $3 to $4 for foremen.

METHODS OF MAKING ASSESSMENTS FOR PUBLIC IMPROVEMENTS IN TORONTO, ONT.

By C. H. Rust, City Engineer.

The Municipal Act, under which all Canadian cities and towns are governed, empowers the City Council to pass a by-law for the construction of sewers, roadways, sidewalks, etc., under what is known as the Local Improvement System; for assessing by special rate, the cost of deepening any stream and draining any locality, or the cost of making, enlarging or prolonging any sewer, or of opening, widening, prolonging or altering, grading or paving any street or alley, or of constructing any sidewalk, bridge, culvert or embankment, or of curbing, sodding or planking any street, or alley, or in any case where a system of waterworks has been constructed by such municipality, then for providing for the cost of the extension of mains and pipes, connecting with the waterworks system, or in any case where a system for lighting within a municipality has been constructed, for providing for the extension of the poles, wires and pipes, for lighting any street or public place; for regulating the time and manner in which the assessments are to be paid, and for arranging the terms on which persons assessed may commute for the payment of their proportionate shares of the cost thereof in principal sums; for effecting any such work with funds provided by persons desirous of having the same effected.

If the contemplated improvement is the construction of a common sewer having a sectional area of more than four feet, one-third of the whole cost thereof shall be provided for by the council, which shall also provide the cost of all culverts and other works necessary for street surface drainage, and also the cost of that part which is chargeable to street intersections and also that part opposite real property exempt from special or local assessment.

The necessary improvements are carried on upon receipt of a petition signed by at least two-thirds in number of the owners of any real property to be benefited thereby; such owners must represent at least one-half in value of such real property. The local Board of Health of any town or city may recommend to the Council the necessity in the public interests of constructing certain sewers for sanitary or drainage purposes, and if the recommendation is affirmed by a vote of two-thirds of the members of the Council, the work can be proceeded with in spite of opposition from the property owners, or the City Engineer may recommend an improvement on the initiative principle and unless petitioned against by one-half the number of the owners, representing one-half in value, the work is proceeded with. In the case of the construction of concrete sidewalks, however, the City of Toronto has recently obtained legislation empowering the Corporation to lay a sidewalk, even if petitioned against, if in the City Engineer's opinion it is necessary in the public interest. The city is also endeavoring to obtain the same legislation in reference to roadways.

In Toronto the practice has been to extend the payments on sewers, asphalt and brick pavements and concrete sidewalks over a term of ten years. In the case of macadam roadways and plank sidewalks the payments extend over a period varying from three to five years, which period is generally determined by the City Engineer. On all sewers less than four feet in sectional area, the rate payers are as-

sessed for the total cost, excepting street gullys, which are paid for by the city.

In the case of roadways and sidewalks the city pays the cost of the work at all street intersections and also asssumes the cost of the improvement upon the flankage allowance. For instance, an owner has a lot 25 feet frontage on a street with a depth of 120 feet on another street. He is assessed for the full frontage of 25 feet, and when the other street is paved, he is exempt for 60 feet, which is paid for by the city. If the lot is deeper than 120 feet an allowance of only 60 feet is made. If the lot is less than 120 feet the city pays for one-half the depth. Churches, which are exempt from general taxes, are not exempt from local improvement rates.

THE INFLUENCE OF COMMERCIAL ORGANIZATIONS UPON MUNICIPAL IMPROVEMENTS.

By Charles Carroll Brown, Consulting Engineer, Indianapolis, Ind.

The American has considered the municipality as a political organization rather than as a business corporation. The elected officers have too often considered themselves experts in municipal affairs as a simple result of their election and have not proceeded to put the technical details in charge of men educated to take care of them as would a number of capitalists or the directors of a company operating a concern of the same financial importance.

Each year sees an advance of the idea that the city should be operated on business principles and this is due to the efforts of organizations of business men, who see the defective results of their municipal government and are looking for the reasons therefor. There are several examples of the benefits arising from their labors.

The Commercial Club of Indianapolis was formed to make the city known outside and to improve its condition within. Examples of its work will show what different lines it may cover.

A paving exposition was held early in its history to arouse interest in the improvement of the city. It was soon found that the resulting movement was checked by the defects in the city charter. The club then bent its efforts in the direction of a modern charter and secured one which serves as a model for others, and which was largely prepared under its direction.

The club often offers advice upon questions of public improvement, taking the initiative in other lines than those mentioned. Thus it was instrumental in securing an adequate solution of the drainage problem by recommending the employment of experts upon it. The request by a heating company for increase in rates was investigated by the club with the aid of engineers and at the request of the municipal officials the report was made to them that it might aid them in coming to their decision.

A Civic Improvement Association was formed under the auspices of the club, which took occasion on the wholesale destruction of the city's bridges by floods to call attention to the need of better and more artistic bridges. The Commercial Club called a meeting of city and county authorities and others interested in the matter and on its recommendation appointed a bridge and stream improvement commission to study the large problem, to advise regarding the character of designs and materials, to give confidence to those making the appropriations that the expenditures would be upon well-considered plans. It largely influenced the passage of the appropriation ordinance and has made its mark upon the plans for bridges already made and will continue its work upon bridges and streams, helping to unify the work of three or four practically independent political bodies which have jurisdiction over parts of the plan.

The Civic Improvement Association takes up many other problems connected with the city's beautifying, such as restriction of tall buildings, smoke prevention, improvement of yards, lawns, trees, etc.

The elevated track commission appointed by the club has pressed the consideration of this question for a dozen years with plans, estimates, resolutions, meetings and any other aids toward an adequate solution of the problems.

The general opinion regarding the club

* Abstract of paper from American Society of Municipal Improvements.

is that its efforts are entirely disinterested and its work is as thorough as the circumstances call for. Its recommendations are therefore accepted nearly always as authoritative. It is seldom accused of putting its nose into other people's business except by those whose plans for securing special advantages are interfered with.

The Merchants' Association of San Francisco, beginning in 1894, first took a contract for street cleaning and raised $30,000 additional to the appropriation by voluntary subscriptions. It demonstrated in eight months that the streets could be kept clean at reasonable cost and the city has since been able to secure similar results through the regular channels.

The association took up the question of a new city charter and secured one in satisfactory form for the local conditions. It has found it necessary to watch most of the steps of installation and operation and prevents many violations of such provisions as those regulating civil service, the letting of contracts, etc. It has presented the city with such improvements as a public convenience station, an "isle of safety" in a busy crossing, a directory to the City Hall.

A valuable feature is a monthly paper, which is a medium of communication with its members and other interested persons. This association seems to find much more detailed work necessary than the Indianapolis club.

New York, Chicago, Newark and several other cities have similar bodies doing good work. Harrisburg and Baltimore are equally favored.

The success of such associations is evidence of the growing interest of business men in the forms of local government. Any man who has an idea which can be applied for the betterment of conditions can get a hearing and help in carrying out a well-considered plan. On the other hand, a man who is pushing an idea with the purpose of benefiting himself is very likely to be found out and his project falls of development or is transferred to other hands.

Many municipal officials, especially of the elective class, recognize their limitations and are glad to have the assistance of a body of men, but few of whom could be induced to accept the ordinary municipal offices, but who are willing to put in a little time giving of their store of knowledge, experience and judgment for the benefit of their elected representatives and thus of their place of residence.

THE USE OF SULPHUR FOR SEWER PIPE JOINTS IN WET TRENCHES.

By E. S. Rankin, Engineer Sewer Department, Newark, N. J.

During the latter part of the year 1903 my attention was called to a new form of pipe joint which was being used in the construction of a system of sanitary sewers in the village of South Orange, N. J. The system consisted of about twenty-three miles of small pipes ranging from eight to twelve inches in diameter and discharging into an outlet to tide water which was used also by several adjoining municipalities. As the capacity of this outlet was limited, the question of water tight sewers became an important one, particularly as ground water was encountered on the greater part of the system. The engineer of the work, Mr. Alexander Potter, after experimenting with several forms of special joints finally hit upon the plan of joining the pipes with a mixture of melted sulphur and fine sand. A description of the joint with an account of his experiments was published in the Engineering Record of March 12, 1904. Mr. Potter has since successfully used this construction on the West Orange system, entirely discarding cement joints.

Having at the time just awarded a contract for the construction of some four and one-half miles of small pipe sewers, connected with the joint outlet and expecting to find water on a considerable portion of the work, arrangements were made with the contractor to use this form of joint in the wet sections. Similar arrangements have since been made on another contract now under construction.

Briefly described, the joint is formed by first caulking the annular space between the hub and spigot with a strand of jute and then filling the remaining space with the melted mixture in a similar manner to pouring lead joints in cast iron pipe. The melting is done in an ordinary lead furnace, care being taken to remove the

pot before too high a temperature is reached. On one small section requiring only a few joints the contractor used an oil stove, which answered every purpose. It is found convenient in practice to join two or three lengths of pipe in cradles on the surface, thus leaving only one joint in every three or four to be made in the ditch. Joints can be made easier and better in this way and the work advances more rapidly, as a number of the jointed sections can be made at odd times and kept in reserve. They can be freely handled or lowered into the ditch within a few minutes after pouring.

Where water stands in the ditch this must, of course, be kept down by pumping while the joint is being made, but may be allowed to rise immediately afterward.

In the experiments above referred to it was found that equal parts of sand and sulphur stood the highest test, the finest sand giving the greatest strength. Dried quicksand apparently being the best material.

When the preparation of this paper was decided on, in order to be able to speak from personal experience a number of experiments were made to determine the strength of the mixture under varying conditions. The briquettes were moulded in the field from the mixture in actual use on the work and broken in a Fairbanks machine. As might be anticipated, the results were not as high nor as uniform as those obtained in the original laboratory experiments. In fact, the tensile strength of briquettes made and broken under apparently similar conditions ranged from 188 to 636 pounds per square inch. This is due very largely to improper mixing, the weak samples invariably showing a considerable section of free sulphur at the top. When it is considered that pure sulphur b eaks at only 100 pounds, while the average strength of a good mixture is from 350 to 400 pounds per square inch, the necessity for thorough mixing is apparent.

Briquettes were broken at ages ranging from 18 hours to 28 days, the age apparently having no effect on the strength. One set was kept in boiling water for 12 hours and another immersed in sewage for 28 days. Still others were made with a view of determining the proper temperature at which the mixture should be used. This was found to be between 240 and 300 degrees. Both above and below these limits the liquid becomes thicker and does not give such good results.

Recently during the progress of the work there was encountered a bed of what is locally known as "bull's liver," seemingly a combination of quicksand and clay in a very finely divided state. This material has proven even better than the sand, giving a more uniform mixture and a higher average test. Acting on the hints thus obtained, some samples were made with pure blue clay, dried, powdered and sifted through a No. 30 sieve.

The following shows the results:

	Pounds.
Average of 15 briquettes, made with equal parts sulphur and sand, varying in age from 24 to 28 days, and broken under normal conditions, per square inch	343
Average of 3 briquettes of same mixture, boiled for 12 hours	285
Average of 2 briquettes of same mixture, immersed in sewage for 28 days	288
Average of 9 briquettes, made with equal parts sulphur and sand and clay, age from 18 to 30 hours	385
Average of 3 briquettes, made with 3 parts sulphur to 2 parts powdered blue clay, age 18 hours	400

Still more tests are needed to definitely determine the best material and proportions to be used; also more particularly whether long exposure to the action of sewage will have a deleterious effect. Briquettes have been made and placed directly in the main intercepting sewer of the city and will be broken at intervals through the coming year, comparison being made with others made at the same time and kept unexposed.

The amount of absorption was also tried, a small brick weighing two and one-half pounds being made and after weighing immersed in water for twenty-four hours. The absorption was found to be about 3-10 per cent of its weight.

Naturally, the most practical test of all is the result obtained by gauging the ground water flow in the completed work, and in this the sewers referred to above compare favorably with those tabulated by Prof. Folwell in his paper read before this society last year.

This system consists of 736 feet of 12-inch pipe, 2,317 feet of 10-inch, 18,718 feet of 8-inch and 1,900 feet of 6-inch house connections, a total of 4.48 miles, draining an area of 137 acres. Of this total practically all of the 12-inch, 10-inch and 6-inch pipe and about 5,000 feet of 8-inch, or a total of 1.77 miles, was laid with the sulphur joints. On the balance of the system, where the ground water could be kept below the inverts of the pipes without pumping, cement was used. The main line was laid at a depth vary-

ing from seven to twenty-four feet, with water throughout its entire length. On some of the branch lines averaging eight feet deep water was encountered from the surface down, one piece of about 200 feet being laid through a pond. It is to be remembered that at the commencement of the work neither the contractor nor the engineer had had any experience with this form of construction; the first sand used was too coarse and in some instances the mixture was used at too high a temperature, resulting in a porous joint. Unfortunately the two sections first opened proved to be the worst in the matter of ground water of the entire system.

The gaugings of the completed work showed an infiltration of 0·22 cubic feet per second, which amounts to 32,000 gallons per mile per day, or 1,100 gallons per acre per day. Compared with the systems recorded by Prof. Folwell, the Newark sewers stand fourth in the list of eleven there given.

For the purpose of comparison the table is here reproduced in condensed form, omitting the brick sewers and inserting the Newark system:

City.	Gals per. mile per day.	Gals. per acre per day.
Schenectady, NY.	4,000	
Champaign, Ill....	30,000	
New Orleans	31,800	1.941
Newark, N. J.....	32,000	1,100
Boston, Mass.....	40,000	
E. Orange, N. J..	43,250	
Several cities in Massachusetts .	75,000	
Malden, Mass. ...	83,000	
English city, not named	140,000	
Westboro, Mass. .	610,000	
Unnamed city in New York.....1,300,000		
Another section in Westboro, Mass.1,320,000		

Excepting Schenectady, Newark stands within less than 10 per cent of the highest, which is probably as close as gaugings of this kind can be made.

On the other Newark system referred to no gaugings have as yet been taken, as it is still in course of construction, but indications point to still better results.

As to cost, one barrel of sulphur, weighing 250 pounds and costing about $6.25, is sufficient for from 95 to 100 joints on a 12-inch pipe.

Taking this cost at 7 cents with 1 cent for jute, 1 cent for fuel, and as near as can be estimated 6 cents for labor, the total cost would be 15 cents per joint, or 5 cents per lineal foot, using three-foot lengths. The cost for other sized pipes will vary nearly in proportion to their diameters.

While the work herein described is to be considered more as experimental than as conclusive, it is believed that where the securing of water-tight work is an important feature, the sulphur joint can be substituted for cement with material advantage.

THE AIMS AND ACCOMPLISHED WORK OF THE NATIONAL MUNICIPAL LEAGUE.

By Secretary Clinton Rogers Woodruff, Philadelphia, Pa.

The municipal problem exists because a "prevalent sense of right" in favor of municipal efficiency and honesty does not exist, and the National Municipal League was organized and has been working to supply this lack. Those who attended the Philadelphia conference for good city government in January, 1894, out of which the National Municipal League grew, were impressed with the great necessity for further information as to the municipal problem, its extent and its cause.

How is a new era for our cities to be inaugurated—how are we to abolish wastefulness and inefficiency and secure the enactment and enforcement of good laws and the selection of men of trained ability and proved integrity for all municipal positions and to prevent the success of incompetent and corrupt candidates for public office? Only by creating and maintaining a deep interest in municipal affairs and by creating a public opinion that will be intolerant of anything short of the best in all matters pertaining to the welfare of our American municipalities.

To this task the National Municipal League has addressed itself, with, I am happy to be able to say, an increasing measure of success. Since its formation in May, 1894, it has steadily pursued its subject. Thanks to its guidance and

inspiration, new local reform organizations have been started and old ones reorganized and both have undertaken and successfully prosecuted important work. Newspapers have been interested and have as a consequence co-operated in spreading information and creating public interest. The printed page and spoken word have been utilized to the same end; in short, an active, aggressive, persistent propaganda has been carried on so that the American people may appreciate the importance and growth of the municipal situation.

The friends of the work, as represented in the associate membership (composed of individuals) and in the affiliated membership (composed of organizations) are, comparatively speaking, few. The enemies of the work, as represented in the bosses and machines and their henchmen and hangerson, are, comparatively speaking, few. The great proportion of our citizens is indifferent. To convert this indifferent class into an interested and educated class is the purpose of the National Municipal League, and to succeed in this it will be necessary to create a prevalent sense of right concerning municipal affairs. There are very few people who approve and support murder. The great mass disapprove and oppose it. The "prevalent sense of right" is against it. Municipal corruption and inefficiency are not actively disapproved of or opposed by our American communities because there does not exist a prevalent sense of right opposed to them. Hence the necessity for an organization working along the lines of the National Municipal League.

Organized in 1894, it has carefully studied the municipal problem from various points of view. It has striven to arouse a wider and a deeper interest in city affairs among the people of the United States. It has sought to learn the cause of present evils and to suggest ways and means for their correction. It has aimed by concrete effort to introduce a new and better order of affairs.

The league affords an opportunity for an interchange of ideas, suggestions and propositions. Through its annual conferences it enables the workers in behalf of municipal betterment to come into personal touch and exchange views. At the Chicago meeting there was one round table conference of nearly five hours' duration participated in by forty representatives of leading local bodies. Through its active committees the league has brought together groups of acknowledged experts and public men of experience who have formulated reports of great value to students and administrators. The constant and increasing use of these reports is the surest test of their value.

Through its executive officers the league is in constant touch with local and national movements concerned with municipal questions. Supplying literature, answering inquiries, suggesting plans, ways and means, and co-ordinating the forces making for municipal improvement constitute their everyday duties and activities. The constantly increasing correspondence is an indication of usefulness of the league in this direction.

The volumes issued by the league are in continuous use in libraries, among students, administrators and public-spirited citizens. They constitute a municipal literature of great importance and usefulness, as Mr. Ivins and many others have testified.

In addition to annual volumes the league issues occasional literature in the shape of leaflets, pamphlets and newspaper articles which have been influential in creating a more general interest in municipal questions. One series of articles was reproduced in a list of papers with a combined circulation of 3,000,000.

The forms of government of our cities need readjustment to modern conditions. The movement for charter reform is the result. What should our cities do to meet the new conditions and eliminate the existing evils? The Municipal Program is the answer. It is a substantial volume of 246 pages, published by the Macmillan Co. It represents two years' hard and persistent effort on the part of experts in municipal work. It has been praised by discriminating critics and used by every constitutional convention which has been held since it was published.

The accounts of American cities are, as a rule, as hopelessly complicated and involved as are their charters. As the Boston Transcript has said:

"The satisfactory comparisons of the expenditures for the various departments of government in the different cities are impossible."

In 1900, at Milwaukee, a committee was authorized to report "such methods or systems of municipal accounting and collection of municipal statistics as it may find to be most advisable." How well this committee, which is still at work, has discharged the duties thus assigned to it, may be gathered from the following

statement from Prof. F. A. Cleveland of Haskins & Sells, and of the University of the City of New York:

"For guidance they have gone to the charters and organic laws. They have also availed themselves of the results of research of political scientists, and of the experience of professional accountants and officers of municipal control. Each result has thus been brought to a critical test. So useful were the schedules of classification thus formulated, that, from the date of their first publication, they have been utilized by cities attempting to restate their reports. In fact, the progress of the work of the committee may be traced in the new classification from time to time adopted by municipalities. Today there are no less than eighty cities whose financial statements bear the stamp of the work of the league; and the United States census officers have made use of them in the collection and classification of municipal statistics. At the last conference of the league it was thought the success of this part of the work of the committee warranted an enlargement of the scope of its labor. The committee was therefore continued and instructed to report in outline a complete system of municipal accounts and reports."

The committee is composed of Dr. Edward M. Hartwell, chairman, City Statistician of Boston and a group of practical accountants, city officials, State examiners and well known students.

The education of coming generations is essential to steady and substantial improvement. This fact has been fully appreciated by the league and no small part of its work has been devoted to purely educational work. In 1900 at Milwaukee a committee with President Thomas M. Drown of Lehigh University, as chairman, was appointed to inquire as to the amount of instruction given in colleges and universities and to bring the necessity for such instruction to the attention of the authorities in charge of these institutions. Two reports were prepared and sent to every college in the country. They have stirred up interest. They have supplied outlines, syllabi and practical directions. They have resulted in the introduction of numerous courses.

At Detroit in 1903 a new committee was authorized to carry on the work among the secondary schools of the country, and it is now at work under the chairmanship of Dr. William H. Maxwell, Superintendent of the Schools of New York. The Committee is made up of a distinguished group of educators, including college presidents, superintendents and teachers.

Nomination reform is a burning question in every State and city in the Union. How candidates for municipal elective offices shall be nominated is a fundamentally important question. This is the problem the League's committee on the subject, appointed at Boston in 1901, has set itself to study. It is going about its work very much as the Municipal Program Committee did, and equally fruitful results are to be expected. Horace E. Deming of New York is chairman of this committee.

Municipal taxation is closely associated in importance and relative value with the question of uniform accounting and statistics. To supplement the work already done by the League along these lines and to co-ordinate the work done in behalf of improved methods of municipal taxation by various local bodies throughout the country, the League at its Chicago meeting in 1904 authorized a committee "to consider what changes may be necessary and desirable in the constitutions and laws of the various states and to make a report setting forth the general principles which should govern such amendments." Lawson Purdy, secretary of the New York Tax Reform Association, is chairman of this committee.

At Chicago the appointment of a committee was authorized to include those actually conducting courses in municipal government, to give to each the benefit of the others' experience and to secure greater co-ordination and unity of effort. The work of this committee will supplement the work done by President Brown's committee of two years ago and carry it to a logical and effective conclusion.

I have sought to show what the aims of the National Municipal League are and what it has done to make them effective. Only those identified with the active management of its affairs appreciate the frequency and extent of the calls upon it for assistance and only those making the calls and receiving assistance can appreciate the true value of the services it renders, but all can appreciate the need for work such as the League has undertaken and the primary importance of good municipal government for all "who want to live in cities that are healthy, clean and beautiful;

cities that are well paved, well lighted and well drained; cities where the officials as well as the people are honest, just and intelligent; where corporations are obliged to treat the public fairly, and where vice and crime can obtain no favors; cities that have plenty of pure water, superior business facilities and moderate taxes; cities which are so desirable and attractive that there is a steady increase in population and wage-earners."

In conclusion we must always bear in mind "that it is only by the purification of our city governments that our State and national governments can be protected from the dangers to which they are exposed by the malign influence of the corruption which has its roots and main support in the cities."

THE AIMS AND ACCOMPLISHED WORK OF THE LEAGUE OF AMERICAN MUNICIPALITIES.

By Ex-President James M. Head, Nashville, Tenn.

The fact that municipal government in America has been said by a distinguished writer to be the worst in the world has, no doubt, led to renewed efforts upon the part of a great many public-spirited citizens to aid in some way relieving our city governments from this criticism. These efforts have taken form in many different ways, a great many of which have resulted in failures, and have only succeeded in making a bad matter worse.

The first effort at reform has usually been made in seeking to dispossess the professional politicians of their spoils, and installing in their place other hungry politicians with all the greed and none of the experience of the old set. Such efforts, in nine cases out of ten, as might be expected, have resulted in shameful failures. The so-called reformers themselves have generally been ignorant, incompetent or corrupt and have usually succeeded in bringing down upon their own heads the severest condemnation of those who supported them.

When such efforts at municipal reform have not taken this course, they have usually resulted in the organization of societies, which through public meetings and the preparation and distribution of literature and the discussion of public questions have contributed very much to ward the education of the public as to their rights and the needs of municipal reform. This, of course, is the first and most important step to be taken before any improvement can be had or be made permanent after it is obtained.

Eight years ago the League of American Municipalities was organized at Columbus, O., and its membership was confined to "Municipalities in the United States and Canada." The purpose of the organization being, as stated in the constitution, "the establishment of an agency for the co-operation of American cities in the practical study of all questions pertaining to municipal administration; the holding of annual conventions for the discussion of contemporaneous municipal affairs; and the establishment and maintenance of a central bureau of information for the collection, compilation and dissemination of statistics, reports and all kinds of information relative to municipal government."

Its membership is divided into three classes, active, honorary and associate. The first class includes all those holding municipal offices; the second all those who have held municipal offices, who may take part in debate, but cannot vote; and the third includes the editors of municipal periodicals and individuals and firms engaged in the manufacture of municipal necessities with no power to vote or take part in the discussions.

It will at once appear that it was the purpose of this organization to bring together all those in any way directly concerned in the practical administration of municipal affairs, and if possible put immediately into practical operation all those improvements which experience has shown to be possible and practicable.

This organization has continued to grow and expand in its membership and influence and embraces practically all the leading and progressive cities of this country.

The work of this organization has not stopped here, but has been directly and indirectly responsible for the organization of State leagues in many of the leading States, wherein the work of local matters may be considered and such legisla-

tion for the cities of the State asked for as will give to the cities that freedom and independence to which they are justly entitled.

The advantages of this organization over all others in bringing about practical results speedily and effectively, is at once apparent. It brings together once a year all those who have been and are still interested in municipal work and all those who are now engaged in the practical work of conducting city governments, to talk over what has been accomplished, compare experiences and help each other in the bringing about of all those results which contribute to the growth, prosperity and improvement of all cities.

It appeals to and excites the ambition of every city official, to do for his city that which some one else has accomplished for his, and suggests ways and means by which these results may be accomplished.

The meetings being held in different cities, it gives an opportunity for city officials to see for themselves how other cities are governed, and where possible engraft upon their own cities reforms that others have accomplished and claim credit therefor with his own people.

To educate the general public is the sure means of securing and maintaining permanent reforms, while to educate the city officials is the speedy means of putting reforms into effect and getting their benefit at once. There is abundant room and much need for the work of all these organizations and even more. Whether that work can best be performed by the united effort of all these organizations, or by their separate and co-operative efforts is a question about which much difference of opinion may exist. Whether we continue to operate separately or unitedly, the membership of the League of American Municipalities is the one body whose action all other organizations seek to influence and control.

It is to the membership of this organization that we must look for speedy relief and practical results in municipal reforms.

I will not undertake to speak of what the League of American Municipalities has done, but prefer leaving that to the individual opinion of all those who have been so fortunate as to attend the meetings. It is not with the past but with the future that we are concerned. What can be done to make the work of all these organizations more effective in the future is the question to which we should direct our attention.

In conclusion I have but one suggestion to offer, and that is for every man, woman and child who is interested in good municipal government to work in season and out to secure for all municipalities absolute and unequivocal local self-government, as far as it can be obtained under the constitutions of the several States. Without this prime condition all other efforts at reform are only temporary makeshifts to meet existing conditions.

I believe with all the earnestness with

EX-MAYOR JAMES M. HEAD,
Nashville, Tenn.

which I am possessed that the people are capable of self-government, and that however good or bad their city government may be, it will be vastly improved the moment the people are made to understand that the responsiblity is upon them, that they have the power to alter, amend or abolish their charter upon compliance with reasonable conditions which may be imposed to secure a certain stability of government, and that the government they have, good or bad, is of their own creation.

As long as municipal governments are treated by the general laws of the land as mere appendages of the State government, to be dealt with at the pleasure or caprice of legislators who know nothing of municipal conditions except as they may be used for political effect, we may expect rotten city government to con-

tinue to flourish. But when the ban is removed and municipal governments are no longer treated by the legislatures of the several states as infants, idiots, lunatics or married women are treated by the general body of the laws, then and not till then may we expect to see municipal governments in America carried to a degree of perfection where they will no longer be a reproach to our civilization and a discredit to a man to be officially connected with them.

THE AIMS AND ACCOMPLISHED WORK OF THE AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.

By Vice-President Charles Carroll Brown, Indianapolis, Ind.

The American Society of Municipal Improvements has just held its eleventh annual convention, and while the attendance has never been large the number present has been very nearly uniform, the dropping out of officials on account of changes in official tenure being offset by the entrance of new representatives of municipalities.

The society now has on its rolls 97 cities as members, and the list of delegates and individual members, printed in the report of the proceedings of the tenth annual convention, contains 161 names. The former number gives the corporations who are now eligible to delegate representation at the meetings of the society and the latter number represents the number of such delegates who were actual members of the society in 1903, with the addition of a few individual members and associate members who, under the constitution, have a connection with the society, though no longer holding municipal government positions.

The society has amply demonstrated its right to existence by the quality of the work it has done, and its nine annual volumes of proceedings (the first two conventions being reported in one volume), form the most valuable collection of practical papers on municipal improvements which has been made in this country. This work has been done under the discouragements incident to the frequent changes in official positions and has depended upon the interest carried over from city to city and from official to official. That is has been so successfully carried on is largely due to the efforts of a few members who have continued in some sort of official connection with municipal work. To show the wholesale nature of the changes made the following comparisons are made.

At the first convention there were 57 delegates present. But four of these names appear in the last list of members, none of them hold the same positions, and one is now holding no municipal office.

Of the 108 members the second year but nine remain, four of them being out of office. These may be said to represent the nucleus of the society, all of them having been prominent in it ever since the second convention. They are D. L. Fulton, Allegheny, Pa., the first secretary; N. P. Lewis, Brooklyn, N. Y.; August Herrmann, Cincinnati, O.; Charles Carroll Brown, Indianapolis, Ind.; G. H. Benzenberg, Milwaukee, Wis.; Ernest Adam, Newark, N. J.; F. J. O'Brien, Oswego, N. Y.; A. D. Thompson, Peoria, Ill.; Robert E. McMath, St. Louis, Mo.

Fifteen of the 161 at the third convention continue their membership, and the increase is fairly steady from year to year.

The origin of a society which is so successful from the standpoint of the scientific student of municipal methods, its objects, and some statement of what it has accomplished should be of interest at such a time as this.

Mr. M. J. Murphy of St. Louis is entitled to the designation of father of the society, though it was left an orphan before the second convention by Mr. Murph's untimely removal from office. While Street Commissioner of the city he corresponded with many municipal officials with reference to the formation of the society and the first meeting was called for Sept. 19, 1894, at Buffalo, N. Y. A preliminary constitution was adopted which stated the object of the society to be "to promote information and to discuss the best methods to be employed in the management of all municipal departments and the construction of public works. Nearly all those present were directly connected with the design and construction of public works, as engineers, commissioners of public works of various designations or councilmen. The predominance, purposely, of this class of

municipal officials gave early direction to the work, and the character of the municipal delegates gave high authority to whatever was presented to the public by the society through the reports of its proceedings in the daily press, the engineering periodicals and its annual volumes of proceedings. The society has developed until its methods of operation are now well represented by the following extracts from its constitution.

Article I—Section 1. The objects of this society, which shall be known as "The American Society of Municipal Improvements," shall be to disseminate information and experience upon, and to promote the best methods to be employed in the management of municipal departments and in the construction of municipal works, by means of annual conventions, the reading and discussion of papers upon municipal improvements, and by social and friendly intercourse at such conventions, and to circulate among its members, by means of an annual publication, the information thus obtained.

Article II—Section 1. Any municipality within America shall be eligible to membership in this society; likewise any engineer, officer or director who shall have charge of, or supervision over, or be employed as a consulting engineer on any public or municipal department work. When a municipality has become a member of the society, then any person of such municipality representing any municipal board or department or any person interested in municipal improvements, who is not a contractor or contracting agent, may also become a member.

Any member who shall have ceased to have charge or supervision of any public or municipal department or work may retain his membership, unless he shall have come under the restrictive requirements of associate membership, when he shall retain membership as an associate only.

Sec. 3. Any proper person interested in municipal improvements or work as a contractor or contracting agent or who is a manufacturer or dealer in municipal supplies, may become an associate member, who shall enjoy all the rights and privileges of full membership, except that of holding office or voting.

Sec. 4. There shall be appointed annually the following standing committees:

1. Street Paving;
2. Electric Street Lighting;
3. Sewerage and Sanitation;
4. Water Works and Water Supply;
5. Taxation and Assessments;
6. City Government and Legislation;
7. Disposition of Garbage and Street Cleaning;
8. Review;
9. Municipal Franchises.

The number on each committee shall be three, and the chairman may add such names as he may deem advisable. No special or standing committees shall be authorized to create any liabilities unless the same shall have been first approved by the Executive Committee.

Sec. 6. It shall be the duty of the chairman of each standing committee to prepare a report, with the aid of his fellow-committeemen, and submit the same at the annual meeting.

Sec. 7. One afternoon, and such other time as may be deemed necessary, shall be devoted to sectional work, the chairman of each standing committee acting as chairman of the section. The chairman of each section shall arrange the program of the sectional meetings in connection with the program committee of the society.

The preparation of programs by the committees named has been one of the features of the meetings and many of the reports prepared by these committees have been land marks, showing clearly the progress of the country in their lines, while others have laid down the directions for others to follow in the future.

An examination of the annual volumes shows that the street paving committee has always been very active. Every advance in paving methods, every addition of new material, has been reported very early to the society and has been fully discussed and criticized with the greatest benefit to the cities to which the new things are presented and to the designers of the same. The most complete and reliable statistics of paving obtainable are included in reports of the committee, especially in its earlier history. These take the form of tables of details of cost, construction and materials, and of abstracts of specifications and methods of work.

Another committee which has made an enviable record is that on electric street lighting, under several successive chairmen. There is an opportunity now for a further record of achievement in the way of statistics, the reports for some years having been devoted more particularly to details of individual cities and methods.

Sewerage and sanitation and water works and water supply have taken less prominent position mainly because the problems presented are less the subjects of controversy and are less open to observation and classification.

Attention should be called particularly to the standardization of the definition of "good repair" as applied to streets under contractors' construction guaranties. The reports of the society's committees upon this subject were immediately accepted as standard and have now made their way into nearly all municipal paving

specifications in the original form or modified to suit local conditions.

Other valuable committees are those on taxation and assessments and on city government and legislation. The reports on rates of taxation in the larger cities are on charter provisions in cities are complete and monumental in their character.

The disposition of garbage and street cleaning have not been popular subjects for discussion in the society, but they have had some share of attention.

The annual reports of the committee on review are the best place to get an idea of what the principal cities are doing, both as to amount of work and methods employed.

The question of uniformity in municipal accounting and in municipal data and statistics has been a prominent one in municipal societies for some years. It was probably first taken up by this society and was considered from the standpoint of the inquirer after information from various cities for aid in his own work. It was soon put on the basis of the benefit to the city and to the pocketbooks of the taxpayers and a special committee was appointed, which has worked out some forms of reports from waterworks, sewer systems, electric lighting plants, street paving, cleaning and garbage collection organizations, etc., some of them in co-operation with other societies. It is still at work with the United States Census Department trying to unify all the efforts to secure uniformity in reports, thus giving an additional inducement to adopt uniform methods of accounting.

Municipal franchises and park development and maintenance are other special committee subjects.

It will be noted that some of these subjects are somewhat out of the line of a society devoted to the problems of construction and supervision and of collection of data.

In President Fisher's address at the ninth convention he notes that there is no other society considering the subjects of street paving, sewerage and sanitation and disposition of garbage and street cleaning and that no other has made a specialty of taxation and assessments, to the discussion of which this society has offered the most valuable contributions published.

He recommends the relegation of the subjects of municipal franchises and city government and legislation to societies more directly interested in them. He does not propose this for such subjects as lighting, parks, waterworks, though they are in the hands of societies of specialists on these subjects, though he does hint that this society does not need to be so thorough in its treatment of these subjects on this account.

The society stands in an intermediate position between those who discuss municipal questions from theoretical standpoints and from those of the legislative and directive departments, and those concerned with the details of a strictly engineering nature. For, while much of its work can be classed with each of these groups of associations, the needs of the supervisor of design and construction, whether engineer, commissioner, Councilman or Mayor, are in mind and the papers and discussions are turned in this direction. The result is a volume of practical aid to the supervisors of public work each year which has the technical value which the engineer requires and the practical application which the non-technical director of public works needs.

EDITORIAL COMMENT

A Week of Conventions at St. Louis.

The Coal Testing Plant at the St. Louis Exposition.

Wide Tires as Good Road Makers.

A WEEK OF CONVENTIONS AT ST. LOUIS.

The first week in October at St. Louis was one of conventions in which those connected with municipal administrations or with municipal improvements were greatly interested.

The greatest convention of the week was the Engineering Congress which held general or sectional meetings every day from Monday to Saturday and enrolled 861 members and visitors from nearly every part of the world, 727 from North American countries, ten from South America, 110 from Europe, ten from Asia and four from Australia. The detailed report of the Congress shows a number of papers of value for municipal engineers which were thoroughly discussed. The Congress was under the management of the American Society of Civil Engineers and was the largest and the most successful in point of numbers and of interest in the proceedings which has ever been held. The official representation of the British Institution of Civil Engineers in the persons of its president and a number of its members was one of the notable features of the occasion, showing the full recognition of the American organization by the larger and older representative body of English engineers. Austrian, French, German, Swedish and Dutch engineering societies were also well represented.

The American Society of Municipal Improvements held one of its most successful conventions at a hotel just outside the grounds. The enrollment was large and the number of members present at the sessions was as large as usual, notwithstanding the fact that the counter-attractions drew away some who are ordinarily constant attendants. The discussions of papers were full and the fears of some that the convention would drop below the usual high standard were not verified, but, on the contrary, as the accompanying report shows, the proceedings will compare most favorably with those of any preceding meeting.

The same may be said of the convention of the League of American Municipalities, which had a most satisfactory experience of the hospitality of East St. Louis, across the river in Illinois. The enrollment of members in this society was unusually large, and the program, with one or two exceptions, was followed very closely. The attractions of the Veiled Prophets were too great to permit meetings on Tuesday evening of either of these two associations. The local entertainment of the league was especially pleasing and an evidence of the interest of the city of East St. Louis in the league.

A joint session under the auspices of the League of American Municipalities, the American Civic Association and the National Municipal League, was held in the Town hall on the model street on Thursday morning. Two programs had been planned for the day, but the demands upon the time of the associations were so great that they were compressed into one. The American Society of Municipal Improvements did not avail itself of the opportunity of official representation offered during the preparation of the program, but its aims and accomplished work were stated by one of its members upon invitation of those in charge of the program.

The confusion of the fair and the congested nature of the program precluded any discussion of questions of interest to all the societies represented, but it was clearly shown that a most valuable joint session of municipal societies could be provided for in case meetings of the various associations at the same time and in the same city could be arranged. The indications now are that co-operation of all the societies interested in municipal matters is more nearly possible and that the advantages of closer affiliation are more fully recognized than they have been heretofore.

The National Brick Manufacturers' Association held an informal convention, registering in large numbers at headquarters in the Mines Building. On Wednesday night a smoker was held at the Missouri Building; the Hydraulic Press Brick Company of St. Louis con-

tributed a trip through as many of the Pike attractions as could be reached Thursday evening, and the association had a taste of Kentucky hospitality in the form of a reception on Friday night at the State building.

A meeting of a number of those interested in the use of cement, most of them particularly interested in the manufacture of hollow cement blocks, was held Friday evening. The interest in an association of cement users, especially block makers, as shown in the October number of Municipal Engineering, was discussed, and as a result of the expressions of the opinions of those favoring the association, there reported, it was decided to call a convention for the organization of the association for Jan 17, 18 and 19, 1905, at Indianapolis. Further detail of the convention will be found elsewhere in this number and in succeeding numbers of this magazine.

THE COAL TESTING PLANT AT THE ST. LOUIS EXPOSITION.

One of the valuable features of the Louisiana Purchase Exposition is the coal-testing plant which has been installed by the U. S. Geological Survey. An appropriation of $60,000 was made for the purpose, with the proviso that all testing machinery and all coals for testing should be furnished free of charge. About half the appropriation was expended in providing foundations and connections for placing and operating the machinery. The delay in securing the loan of all the machinery necessary from manufacturers prevented the opening of the plant for work until the latter part of September, but some good results are now expected.

Experts, either regular or special employes or assistants on the U. S. Geological Survey are in charge of the sampling of coal and of the operation of the testing machinery and chemical laboratory. The list of machinery shows that there are facilities for testing the burning of coal in ordinary furnaces, in briquette form, as coke, and as producer gas in gas engines. Boilers, steam and gas engines, dynamos, pulverizers, dryers, briquetting presses, coal washers, conveyors and all the smaller apparatus necessary in such a plant have been loaned by the manufacturers and the freight on them has been contributed by the railroad companies and others. There is perhaps $100,000 worth of such apparatus in use.

Relative efficiencies of different coals will be determined, but the primary purpose of the tests is the comparison of methods of utilizing different grades of coal, especially from the standpoint of economy.

One method of burning coal which is of growing interest is in pulverized form with air blast. This method has been successfully applied in cement burning and there are several boiler plants in which it is now in use. There are indications that this may be one of the most economical methods of burning coal and it will be very unfortunate if it is not tested in comparison with the other methods in use in this plant. No doubt the manufacturers would donate the necessary pulverizers and feeders, and boiler settings will not be expensive. The plant was started so late that it will probably run after the Exposition closes and there is thus time to instal the small amount of new machinery necessary.

WIDE TIRES AS GOOD ROAD MAKERS.

The claims made in an article from Col. Anderson on convict labor for road and street making, printed in the October number of Municipal Engineering, vol. xxvii, p. 245, for the reduction in cost of construction by the use of labor otherwise idle and a source of constant expense, have aroused a correspondent in Memphis, Mr. J. M. Heiskell, to present the cause of wide tires as makers and preservers of good roads at even less expense. The following extracts are made from his letter:

We are now spending very much more in voluntarily making roads bad than convict labor could ever save in the effort to make roads good. A board of officers, Ordnance Department, United States Army, report that "the tests by the board show in all cases wide tires leave the road in better condition than before they passed over it. The wider the tires the more marked is the improvement to the roads." This shows plainly that if roads are disgraceful, it is because we choose to make them so—because we do not choose to use wheels which would prevent such disgrace.

This same board, also Studebaker Bros. and many others, say: "On hard, smooth roads the wide tires pull rather harder." Studebaker Bros. go so far as to say: "We advocate the narrow tire for good roads and pavements," although, "turnpike and macadam road companies do not

sufficiently appreciate the beneficial effect of wide tires." Such conflicting general conclusions as these, drawn from a particular (bad) case, tend to keep the people from finding out the scandalous import of bad wheels as a matter of choice.

Mr. M. O. Eldridge, Assistant Director, Office of Road Inquiry, says: "There is no particular advantage in wide tires as to traction, but their improvement to roads is of such material advantage that we should do all in our power to bring about their general use."

Except where wide wheels are given the work of repairing after bad wheels, the narrow or more destructive wheels pull harder every time. These men say, in effect, that more marked, i. e., quicker improvement, requires wider wheels. Of course quicker effect calls for greater pull, which means the greater the pull the sooner will the good work be finished. The only fair and sensible thing t do is to remove the cause of the trouble, and require of good wheels only the pull due to their own lesser destructiveness.

On page 10, bulletin 12, office of Road Inquiry, just above the Studebaker conclusions, we find this: " A three years' test of wide wheels in practical work over four and one-half miles of improved macadam roads, shows a reduction of cost of handling stone from 80 to 60 cents per ton. These teams (three horses) and wide, non-tracking wheels, smoothed down even the slightest ruts caused by narrow-tracking tires, of which there were and are very many in use on this road. * * * When these wagons were first put into use the road was rough and rutty, and the work of hauling was severe on the horses, but soon the broad tires began to roll and pack the road surface and it is difficult to exaggerate the great benefit these tires have produced by keeping the road smooth and hard and the amount of labor they have saved in the work of hauling and repairs."

Here we have a practical, cash value test, where the wide wheels first pulled enough harder to put the road into good shape, and then pulled enough easier (on a good road, too,) to be credited with 25 per cent of the narrow wheel cost of hauling. It would be more accurate to think of the bad wheels as adding 33 1-3 per cent to the wide wheel cost of hauling.

The writer has not seen a better point for wide tires than this which Mr. Heiskell makes. It is certaintly penny-wise and pound-foolish to spend large sums of money to keep roads in good condition for the very slight advantage, if any, that there may be in traction with narrow tires, when the use of wide tires will improve the roads and keep them good with an increase in necessary tractive power, after the road is smoothed into shape by the wide tires, which is practicably negligible.

The data from experiment are not numerous and the conclusions have been drawn from insufficient data and without careful correlation. The general opinion seems to be that on a good road there is no particular advantage in traction with a wide tire and that on a road which has been cut up or worn into ruts by narrow tires the traction is heavier. The difference between narrow and wide tires on a good road is negligible in comparison with the effects of grades, and Mr. Heiskell is surely correct in his claim that the narrow tires must be charged with the increase in power required for wide tires on rutted roads, since these tires by their nature must not only carry their load, but must repair the road after the narrow tires. This method of bookkeeping is commendable because it places the blame where it belongs and vastly increases the credit of the wide tire. May it hasten the day of the adoption of wider tires on roads and streets not covered by hard pavements at least.

THE QUESTION DEPARTMENT

THE CEMENT AGE.

Please send me the address of the "Cement Age."

A. P. W., Wellsboro, Pa.

The "Cement Age" is edited by R. W. Lesley, president of the American Cement Company and is issued from No. 42 Broadway, New York.

WHITE PORTLAND CEMENT.

In answer to inquiries concerning white Portland cement, Mr. J. Lecomte, Mexico, Mex., states that he sells a brand of this nature but does not say whether it is a slag cement, a plaster or a true Portland cement, all three being on the market under the name "Portland."

REMOVING STAINS FROM CEMENT WORK.

In response to the inquiry in Municipal Engineering, vol. xxvii, p. 278, for a preparation to remove stains from cement work or mortar stains from limestone, the St. Louis Crushed Quartz Company of St. Louis, Mo., reports that the general manager of the company, Mr. McDonald, will shortly place on the market a preparation for removing stains from cement work.

CRUSHED GRANITE FOR SIDEWALKS.

The St. Louis Crushed Quartz Company of St. Louis, Mo., calls attention to the omission of its name from the list of dealers in granite sand in Municipal Engineering, vol. xxvii, p. 277, in the reply to an inquiry for dealers in this material for use in making cement stone finish for pavements. This company produces a finely crushed hard dolomite, which is in successful use for the purposes named, and is in demand for granitoid walks, curb and similar artificial stone surfaces, being used in such cities as Cincinnati and Louisville in preference to the crushed gray granite available there, and being shipped to nearly all parts of the Mississippi Valley and the Southern states.

It is said that this stone is harder than ordinary Missouri granite, which, in turn, is harder than Lithonia, Georgia, granite. In color it is a shade darker than Lithonia crushed granite and considerably darker than the average of Missouri gray granite.

MOSAIC CEMENT STONE.

In your issue of April, 1903, page 258, you refer to a company in Cleveland manufacturing mosaic cement stone. Can you give me the name of this company?

C. B. H., ———, Wash.

The firm referred to in Mr. Gibson's article on "The Use of Concrete in Architecture" on the page named is the Schubert Mosaic Tile Company. The composition used seems to be magnesian in its character and to be made according to a German formula. There are several makers of cement tile and Venetian mosaic can also be made in place by an expert, using marble or other stone chips and cement mortar.

PATENTS ON HOLLOW CONCRETE BUILDING BLOCKS, WALLS AND MACHINES.

Certain makers of machines for making hollow concrete blocks claim patents on the hollow wall. What information can you give on the question of patents on blocks, walls and machines?

W. G. S., ——, N. M.

Reference should be made to Municipal Engineering, vol. xxiv, p. 436, for a list of the early patents on hollow blocks and walls, beginning with July 24, 1877, with a patent on a special form of hollow block which disclaims novelty of the hollow block and claims only the special form. Articles on machines and methods of making blocks with statements regarding patents on the same will be found in many numbers of the magazine, such as vol. xxiv, pp. 192, 234, 279, 356, 393, 435, 436, 453, 455, 457; vol. xxv, pp. 53, 54, 129, 375, 390; vol. xxvi, pp. 20, 22, 281, 313, 319, 323, 354, 371, 389, 416, 426; vol. xxvii, pp. 26, 106, 117, 178. Those in vol. xxv, p. 375, and vol. xxvi, p. 20, make special mention of patents.

As is well known to all constant readers of Municipal Engineering there are no exclusive patents on hollow blocks or on hollow walls, though there are many patents on special forms of hollows and special methods of forming them and using them.

MARBLE FOR MOSAIC WORK.

Please inform us where we can get crushed marble for mosaic work.

G. H. C., Oskaloosa, Ia.

Perhaps the nearest dealers in marble for mosaic work to the locality of the inquirer are the Davidson Bros. Marble Co., Chicago, Ill. Sherman & Flavin, Chicago, may also be able to supply the desired material. Other marble producers who can supply ordinary crushed marble or screenings, are given in "Hendricks's Directory" as follows: Beldens Falls Marble Co., Columbian Marble Quarrying Co., Evans Marble Co., Georgia Marble Co., Verd-Antique Marble Co., all of Chicago; Carthage Consolidated Quarry Co., Carthage Marble and White Lime Co., Carthage, Mo.

CRUSHING STRENGTH OF HOLLOW CONCRETE BLOCKS, COMMON BRICK, VITRIFIED BRICK AND STONE.

We are anxious to know the crushing strength of hollow concrete blocks as compared with the strength of common brick, vitrified brick and the various kinds of natural stone.

TOPEKA HYDRAULIC STONE CO.,
Topeka, Kas.

The following data are at hand in answer to this question:

With reference to hollow concrete blocks, in vol. xxiv, p. 457, is given the claim of one block maker of a crushing strength of 1,600 pounds per square inch; in vol. xxvi, p. 426, will be found the results of a number of tests by Prof. A. Marston of Iowa State College. The average crushing strength of large shapes of blocks without reference to age, size, shape or method of making blocks was 820 pounds per square inch for fifteen samples. Two-inch cubes cut from the blocks averaged 1,028 pounds per square inch for fifteen samples. The strength of hollow concrete blocks depends upon the richness of the concrete, the materials of which it is made, the density of the blocks, their age, and method of making, as well as method of making the tests, so that there may be great differences in reported results of tests which might readily be explained if there were full information upon all these points.

Prof. Marston's paper gives 1,850 pounds per square inch crushing strength of 2-inch cubes of soft brick, three samples; and 3,370 of common brick, six samples. Whole brick laid flatwise require from 7,000 to 17,000 pounds per square inch to crush them, but a pile of three bricks flatwise only requires 3,700 to 3,800 pounds per square inch to crush, common and face brick being about the same. Brick piers twelve inches square and one foot, four inches to ten feet high are but 0.06 to 0.27 as strong as the brick alone.

The crushing strength of paving brick set edgewise, as in a pavement, is from 4,800 to 20,000 pounds per square inch.

The crushing strength of cubes of sandstone is 5,000 to 15,000 pounds per square inch; of limestone, 7,000 to 20,000; of marble, 8,000 to 20,000; of granite, 12,000 to 21,000, and of trap rock, 20,000 to 24,000.

The effect of various materials and of various proportions of materials upon the strength of concrete will be seen on reference to vol. xxiv, p. 15, of Municipal Engineering, where variations in strength from 529 to 4,700 pounds per square inch are shown and the relations of these variations to composition of concrete. Other data on this subject will be found in vol. xxii, p. 237; vol. xxi, p. 112, and vol. xix, p. 43. The figures given above for strength of concrete blocks are certainly not the maximum attainable.

Sand lime brick are reported in vol. xxiv, p. 219, and vol. xxv, p. 244, to crush under 3,518 to 7,745 pounds per square inch, and by Prof. Marston in vol. xxvi, p. 426, at 2,097 to 3,210 pounds, showing great variations due to conditions of manufacture.

Brick made of cement and sand crushed in 2-inch cubes for Prof. Marston at 570 to 1,809 pounds per square inch.

LIFTING MACHINE FOR CEMENT BLOCKS.

Kindly advise us of the name and address of the patentee of No. 732,884, noted on page 317 of your October number.

H. H. W., Dallas, Tex.

The patent, which is for a fork with which to lift building blocks, especially in removing them from the machine in which they are made, was issued to L. P. Normandin of Jackson, Mich., and is a part of the apparatus obtainable with the Normandin machine for making hol-

low concrete building blocks, which is made by the Cement Machinery Company of Jackson, Mich.

CONCRETE BUILDING CONSTRUCTORS.

Would you give us the names and addresses of a few concerns which have had experience in erecting fireproof warehouses with cement used for interior work? H. AND K., Pittsburg, Pa.

Reference may be made to the "Business Directory" printed in each number of Municipal Engineering under the headings, "Civil Engineers," for names of designers and superintendents of such work, selecting especially those who give concrete, cement and building construction among their specialties; also under the headings, "Concrete Work" and "Contractors" for constructors of such work. The list includes firms using every class of concrete construction and communication with them will bring information on which to base a selection of methods and men.

BUILDING OF CONCRETE DAMS.

In response to the inquiry in vol. xxvii, p. 227, for names of builders of concrete dams, the following persons have sent their names to the editor: Ambursen Hydraulic Construction Company, 176 Federal-st., Boston, Mass; Fairbury Cement Stone Company, Fairbury, Neb., through W. W. Watson, City Engineer; E. Van der Osten & Co., Toronto, Ont.

CONCRETE CHIMNEY DESIGNS.

Can you refer me to an engineer who has erected smoke stacks consisting of Portland cement and sand?
C. F. I., North Platte, Neb.

Some smoke stacks have been constructed of cement, sand and broken stone in Germany, but no information cerning such stacks in this country is at hand. Several stacks have been constructed of concrete reinforced with steel in various forms. Reference may be made to the "Business Directory," printed in each number of this magazine under the heading "Civil Engineers" for names of persons competent to design such structures, especially those who include concrete, Monier and other steel-reinforced constructions and buildings. Some of these have already constructed similar works, L. C. Wason, 8 Beacon-st., Boston, Mass.; the Osborn Engineering Company, Osborn Building, Cleveland, O., and F. W. Cappelen, Minneapolis, Minn., for example.

Ransome & Smith, New York; Carl Weber, Chicago; the Turner Construction Company, New York, are other constructors of concrete-steel chimneys.

STABILITY OF CONCRETE BRIDGE.

A concrete arch is proposed of 20 feet span, semi-circular, the arch ring of which is two feet thick at the crown and three feet at the springing line on vertical wall four feet high and spread to four feet thick placed on a foundation spreading to eight feet and four feet deep. The roadway is 22 feet above the crown of the arch or 36 feet above the foundation, and a parapet wall, three feet high is on top of this. The fill for the roadway is to be confined by vertical concrete walls 18 inches thick, tied together by two rows of 1¼-inch steel rods with nuts and 12-inch washers passing through from one wall to the other, nine in all. The walls are about 100 feet long, stepped off in two steps on each side to fit the slopes of the sides of the bayou. Dirt will be well packed in between them as the work progresses. Drain holes are cut through the walls at intervals along the level of the roadway. The total width of the bridge is 23 feet. What is your opinion as to its stability?
T. J. T., Natchez, Miss.

The above question was accompanied by a pencil sketch showing the data given. In the absence of definite personal knowledge of the exact conditions as to foundation, materials, drainage, etc., no definite opinion can be expressed; only the general one that sufficient attention has not been paid to character of foundation and the form and strength of the side walls is not such as to insure a permanent structure. Unequal settlements of foundations of arch and spandrel walls bring strains on the structure which would soon put it in bad condition. The assistance of a competent engineer with experience in concrete construction who can visit the locality and make a design to fit the conditions is recommended as a measure of economy as well as safety.

The location of the drains is not conducive to the beauty of the outside surface of the wall, as it will be much discolored by the water from them. If the water were all drawn through one or two pipes running out through the fill and through the top of the arch this objection would be met.

MAKERS OF CONCRETE CONDUITS.

Can you give us the names of manufacturers making concrete conduits of large size, such as 66 and 72 inches?

C. L. O., Ft .Wayne, Ind.

Conduits of this size are made in place, either monolithic or of blocks molded and cured at a nearby factory or yard and set in place. The cost of transportation of suitable materials make this the most satisfactory method. The "Civil Engineers" listed in the "Business Directory" printed in each number of Municipal Engineering who make specialties of cement work and of sewerage, are competent to design and construct such conduits. It is probable that if they are made monolithic they could be reinforced with steel with economy. For firms designing such work see the headings "Expanded Metal Construction" and "Concrete-Steel." Several of the contractors whose names appear under the heading "Concrete Work," have done this class of work.

Descriptions of several sewers and conduits of reinforced concrete will be found in Municipal Engineering, such as "Reinforced Concrete Sewers in Wilmington, Del.," vol. xxvii, p. 248; "Concrete Sewers," vol. xxiv, p. 253; "The Construction of the 60-inch Reinforced Conduits of Newark, N. J.," vol. xxv, p. 364, etc.

CHARGES FOR ENGINEERING SERVICES.

Will you kindly inform me through your valuable magazine on the per cent usually charged by engineeers for engineering work, such as water works, electric light systems or similar municipal work?

Would it be consistent for the engineer to give a guaranty, as asked by some parties, that the work done by the contractor shall be according to plans and specifications?

The engineer in some cases cannot be on the ground continually. If an inspector is to be employed is he to be paid by the engineer or by the party having the work done?

K. C. SCHAUB,
Logan, Utah.

The methods of charging for services are about as numerous as the engineers in general practice. There have been several attempts to fix schedules of charges, but more of them have been successful. This is in part because there is no general opinion among engineers that it is advisable to fix such a schedule and in part because the varieties of work are so many that no fixed schedule can fit them all. It is almost always the case in a new country, developing without special assistance from large corporations, such as mining, land or other development companies, that the engineer's value is not appreciated and he is expected to work at day laborer's wages. As a consequence the engineering at this stage is poorly done and the work must be done over later. As the country develops the value of the engineer becomes more apparent and the necessity for paying what is necessary to secure competent men is more evident and as it grows old the professional engineer's emoluments increase. He receives at all times, not what the work he is trying to do justifies, but what his employers think it justifies. They get the kind of service they pay for, usually, and their lessons are ultimately very expensive to them. In vol. xiii, p. 197, of Municipal Engineering will be found a schedule of fees adopted by the California Association of Civil Engineers some fifteen years ago, which is a fair sample of the attempts at regulating charges, though the percentages are perhaps a little higher than the average. They were much higher than the average charges actually made by engineers at that time and have not yet been attained except by a very few whose abilities and reputations as engineers or as business men make it possible for them to demand the maximum. These percentages range from 10 per cent for work costing less than $5,000 to 3 per cent for work costing more than $500,000. Preliminaries are placed at 1.5 to 0.2 per cent for variations in cost of $5,000 to $500,000, but this is an elastic term, and there is room for considerable variation in charges for them. The cost of plans and specifications varies from 2.5 to 1.0 per cent as above, for details from 1.0 to 0.1 per cent, for supervision from 1.7 to 0.6 and for engineering superintendence from 3.5 to 1.2 per cent. All these classes of work are subject to much variation in actual cost and in value in proportion to the total cost of the work, and some of them might be considered as including others. The schedule has not been operative, doubtless because it cannot be applied directly to every piece of work and has seldom, if ever, been strictly enforced. It may serve, however, as a guide in estimating the value of professional work with the exact cost of which the engineer is not familiar.

It is difficult to see the value of the guaranty proposed. The engineer is employed by the owner and his judgment is subject to error. So long as he is honest it is probable that the courts

would not hold him financially responsible for the results of his own errors. If he is put in complete control of the contractor he is subject to errors of the same class in his supervision of the work and bad work will also creep in from oversight and deception. The courts would probably not hold an honest engineer financially responsible for these errors to any greater extent than the amount of the contract price for his services, even if the engineer guaranteed the contractor's work. The engineer is seldom able to give such a guaranty as that proposed, the depth of the pocketbook of engineers in localities where such requirements are suggested not being sufficient to cover work of any magnitude. The guaranty is unprofessional, the engineer being in the professional and official class where duties are ministerial and subject to errors of judgment, for which, if acting in good faith, they can not be held responsible; it is not businesslike, no person being safe in binding himself for the good behavior of another over whom he has little or no control, and it is useless, since it could probably be sustained in court only to the extent of the engineer's proposed compensation for his work, if at all.

The above schedule of rates includes inspection in the item of engineering superintendence and if the engineer is paid on this schedule he should pay inspectors. Ordinarily he should make his charges sufficient to include the employment of inspectors, whose appointment he should make and of whom he should have full control. Inspectors are often paid by the owner, however, especially in city work. Much dissatisfaction results from this practice, unless the engineer retains complete control of them. In the absence of a definite agreement and in case of difference of opinion on this question the circumstances of the individual case must be determined by arbitration or trial if satisfactory settlement cannot be obtained without.

MANUFACTURERS OF HAND STREET SWEEPERS.

We are looking for a hand machine sweeper and would like some information about them

S. L. P., Denver, Colo.

Reference may be made to the "Business Directory" printed in each number of Municipal Engineering under the heading, "Street Sweepers," for names of manufacturers of such apparatus. The Sanitary Street Sweeping Company of Washington, D. C., there named, manufacture hand-power machines. This machine is described and illustrated in Municipal Engineering, vol. xxvii, pp. 79 and 309. Most hand machines are scrapers or simply carts with mechanical devices for lifting street sweepings to a bag or barrel, or combinations of the two, but the one above mentioned is a true mechanical sweeper which picks up its sweepings and permits their deposit at selected points of discharge.

BINDING FOR MUNICIPAL ENGINEERING.

Do you bind the magazine as it comes to us or do you take out the advertisements?

W. C. MACDONALD.
Town Engineer, Stellarton, N. S.

The Simplex Binder which is furnished to subscribers as described in the advertising pages, is adjustable so that a volume of Municipal Engineering can be bound at home either with or without the advertising pages. There is so much valuable matter in the advertising pages that at least one number of the magazine should be kept on hand complete at all times. When regularly bound volumes are ordered the advertising pages are removed unless special instructions are given to retain them.

THE MILES CONCRETE BLOCK MACHINE.

What can you tell me about the Miles concrete building block machine?

B. F. B., Newcastle, Ind.

This is one of the later machines which has not yet been described in Municipal Engineering. The machine was patented Sept. 15, 1903, and the special claims of the patent are for a tilting frame, one side of which can be opened on hinges, sections of a mold adjustable in form size and position in the frame, and a core removable through one of the sections, one of the side sections of the mold being removable and serving as the carrying-board for removing the manufactured block.

The block is thus molded face down and is tilted on its side for removal of the core and for removal from the machine and for storage. Special designs may be made for the shapes of blocks and for the face, the position of the face during manufacture being the most favorable for making it of any desired mixture and with any desired pattern.

CONVENTIONS, MUNICIPAL AND ENGINEERING

American Society of Municipal Improvements—League of American Municipalities—Civic Day—National Brick Manufacturers—Association of Cement Users—Engineering Congress.

The American Society of Municipal Improvements.

The eleventh annual convention of the American Society of Municial Improvements was called to order promptly at 2 p. m., October 4, and the regular business according to the program was proceeded with. The list of members, new and old, registered during the day is as follows:

Atchison, Kan., Fred Giddings, City Engineer.

Baltimore, Md., B. T. Fendall, City Engineer.

Birmingham, Ala., J. M. McCartin, Street Commissioner; Julian Kendrick, City Engineer.

Chicago, Ill., A. A. Adler, associate.

Columbus, O., Julian Griggs, City Engineer.

Concord, N. H., Alfred Clark, Commissioner of Highways; W. B. Howe, City Engineer.

Easton, Pa., Prof. A. P. Folwell, Lafayette College.

East Orange, N. J., W. H. Reimer, City Engineer.

Economy, Pa., J. Carroll Barr.

Erie, Pa., Ben E. Briggs, City Engineer.

Essex County, New Jersey James Owen, County Engineer.

Grand Rapids, Mich., L. W. Anderson, City Engineer; John C. Brown.

Indianapolis, Ind., William Fortune, Charles C. Brown, Municipal Engineering.

Little Rock, Ark., W. S. Reichardt, City Engineer.

Media, Pa., William Easly, Municipal Engineer.

Montreal, Quebec—Alcide Chaussee, Building Inspector; John R. Barlow, City Engineer.

Newark, N. J.—George M. Ballard, Chairman Water Committee; A. F. Eggers, Board of Works; C. V. Baumann, Street Committee; George H. Phillips, Board of Public Works; Ernest Adam, Engineer Street and Sewer Department; M. R. Sherrerd, Superintendent of Waterworks; E. S. Rankin, Engineer Sewer Department; J. B. Stobaeus, member Board of Trade.

New York City—George W. Tillson, Chief Engineer Bureau of Highways of Brooklyn; C. D. Pollock, Assistant Engineer of same; F. A. Kummer, 29 Broadway; J. M. Goodell, Engineering Record; A. J. Provost, jr., Engineer to Brooklyn Borough President; Wisner Martin, Assistant Engineer Manhattan Bureau of Highways; S. C. Thompson, Assistant Engineer Bronx Bureau of Highways; H. W. Wilmot, 54 William-st.

Oswego, N. Y.; F. J. O'Brien, Street Commissioner.

Rochester, N. Y.—E. A. Fisher, City Engineer; W. J. Stewart, First Assistant.

Rockford, Ill.—Frank J. Phinney, Superintendent of Waterworks.

St. Louis, Mo.—R. E. McMath, 327 Lincoln Trust Building.

Toronto, Ont.—C. H. Rust, City Engineer; John Jones, Superintendent of Streets.

Wilmington, Del.—George Rommell, jr., Engineer Street and Sewer Department; L. V. Christy, Secretary Street and Sewer Department; T. Chalkley Hatton, Consulting Engineer.

Winnipeg, Man.—H. N. Ruttan, City Engineer.

The Secretary's report showed the society to be in good condition and that an arrangement had been made whereby the publication of the volume of proceedings brings in some revenue.

President George M. Ballard in his annual address called attention to the importance of increasing the membership of the society, but said that it had not been thought feasible at the present time to hold joint sessions with other organizations somewhat similar.

The report of the Committee on Uniformity in Municipal Data and on National Statistics, William Fortune, chairman, was presented. It called attention to the schedules for the collection of social statistics of cities and statistics of municipal finance, which have recently been prepared by the Bureau of the Census of the United States Department of Commerce and Labor, and to the promise of the authorities to consider favorably the forms of report adopted by this society when preparing schedules on the same lines. It quoted from a paper by

L. G. Powers of the Census Department as follows:

Whatever the defects of the census schedules may be they cannot be charged to any lack of friendly interest or co-operation on the part of city officials. The difficulties that must be overcome

PROF. A. P. FOLWELL, EASTON, PA.
President A. S. M. I.

before we can secure the adoption of uniform methods of accounting for all our larger cities, and thus lay the foundation for truly comparable statistics, seem to me to be as follows: We must demonstrate beyond a doubt that it is possible to arrange a classification of municipal payments and receipts that shall be applicable to all cities. This census report on municipal finance will show something of the limitations within which the scheme of classification adopted by this league can be made the basis for a uniform system of accounts. I believe that scheme, with minor changes, can be made of a common classification of accounts and hence of a uniform system of accounting for all our cities.

The report also called attention to the Ohio law providing for State supervision of municipal accounts and quoted as follows from a paper before the Michigan Political Science Association upon this side of the question as follows:

It is evident that the requests of any number of societies can be of but little value in changing forms of accounts and reports, and that such laws as that of Ohio produce in two or three years results which it would take generations to produce in any other way.

It seems to the writer, therefore, that the step taken in Ohio is the greatest advance which has been made.

What is needed is expert control, supervision and periodical inspection of accounts by a competent state department. Uniformity of municipal accounts is an essential detail of the easy and economical application of a law with these provisions.

Uniformity in municipal reports is desired by many officials of all departments of government. It is attainable without absolute uniformity of methods of accounting, but is very difficult, if not impossible, under present conditions. It is doubtful if a provision merely for uniformity in reports would be considered of sufficient value by legislators to be established, though it would be of great value, but it is an essential part of the more inclusive law and the sentiment in its favor can be made to add to the influence needed to secure the enactment of the law.

The national law requiring the collection of municipal statistics is an additional source of such influence, both in itself and in the efforts of the government officials to get the data required in such form as to be valuable.

Let us work then for the state control

CHARLES CARROLL BROWN,
INDIANAPOLIS, IND.
First Vice-President A. S. M. I.

of the accounts of the various taxing bodies of the commonwealth and all the rest that we desire will come to us without further effort.

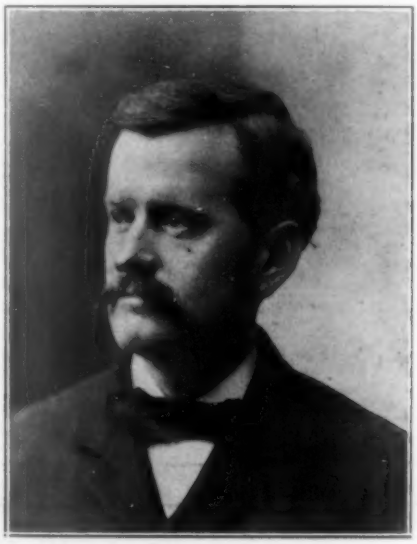
Mr. Reichardt's paper on the sewerage of Little Rock, Ark., printed on page 337 of this number, brought forth considerable discussion, all of which emphasized the points in the paper, that municipal

work cannot be done piecemeal, but must have a well-developed general plan, and that construction must be in charge of competent, honest and careful engineers. The paper will be pointed to as an excellent description of the results of lack of method and of modes of procedure to be avoided. Attention was called to methods of back filling and of tunneling and Mr. Tillson described the settlement of the street over the rapid transit tunnel, which was in sand, although every precaution was taken to fill all void spaces. House fronts thirty feet away have cracked and occasionally the entire street has settled from three to six inches. A large sewer trench from twenty-five to seventy-five feet deep, which was not properly back-filled twelve years ago, is still giving trouble from settlement. The soil is gravel and sand. Mr. Adam and Mr. Fisher reported similar difficulties, which were only overcome by digging down to the sewer and refilling with proper tamping.

Upon request for an expression on the necessity of organizations, such as those

CITY ENGINEER J. R. BARLOW, MONTREAL, QUE.
Second Vice-President A. S. M. I.

described in Mr. Brown's paper, an abstract of which is printed elsewhere, Mr. Adam gave some account of the work of the Newark Board of Trade, which discusses such matters as intercepting sewers and water supply and is the principal means of securing such improvements for the city. Local improvement societies had their day, but have dropped out. The Board of Trade is a body of men who have organized to further and protect the interests of the city, great and small.



CITY ENGINEER W. B. HOWE, CONCORD, N. H.
Third Vice-President A. S. M. I.

Mr. Rust thought these gentlemen would do more good if they went into the City Council, and has found the citizens' organizations of little value in Toronto. The representatives of cities in the United States envy somewhat the better conditions in some respects which exist in Canadian municipalities, but believe that so long as the citizens' organizations confine themselves to the initiative steps and do not interfere with honest and expert carrying out of the plans they are instrumental in inaugurating, they have a very important duty to perform. Prof. Folwell, Mr. Owen, President Ballard, Mr. Eggers, Mr. Reichardt and Mr. Sherrard united in developing this idea in the discussion, with Mr. Rust as the only one who had found the work of such organizations useless or the cause of useless expense.

At the meeting on Wednesday morning, Oct. 5, officers were elected as follows:

President—A. Prescott Folwell, Easton, Pa.

First Vice-President—Charles Carroll Brown, Indianapolis, Ind.

Second Vice-President—John R. Barlow, Montreal, Canada.

Third Vice-President—W. B. Howe, Concord, N. H.

Secretary—George W. Tillson, Brooklyn, N. Y.

Treasurer—F. J. O'Brien, Oswego, N. Y.

CHIEF ENGINEER GEO. W. TILLSON, BROOKLYN, N. Y.
Secretary A. S. M. I.

Finance Committee—Alcide Chaussee, Montreal, Canada; E. S. Barrow, Hamilton, Canada; A. F. Eggers, Newark, N. J.

Montreal was selected as the next place of meeting and the time was fixed between Sept. 1 and 15, 1905.

On Thursday morning Mr. T. Chalkley Hatton presented a paper on the municipal ownership of water supplies, which gave rise to considerable discussion. Mr. Folwell gave an instance of a city which could not build its own plant on account of the limit of indebtedness. The citizens formed a water company and put in $500,000 cash to construct the plant on which only $5,000 in bonds has ever been issued. There is no water in the capitalization. The plant pays its expenses on a comparatively low schedule of private water rates and receives nothing from the city for fire hydrants.

Mr. Hatton has computed the average charges for the use of water in the cities of the United States and finds the average for private corporations is $18.82 a year, while that for municipal plants is $13.57.

Mr. Reimer explained the method of obtaining control of a water plant under the New Jersey statutes. The plant can be condemned by process of determining the valuation in court or the municipality may construct its own plant without reference to any existing plant. The cost of this plant can be met by assessments on the property benefited, so that the water could be furnished free if thought advisable. This puts the water company wholly within the power of the community in which it operates.

Discussions of interest to the members on many points in the other papers presented on the three days of the convention followed their reading. Most of these papers are printed in full or in abstract in this number of Municipal Engineering as follows:

"The Pollution of the Passaic River and its Prevention," by Ernest Adams, on page 327.

"Sewage Disposal for Small Cities and Towns," by T. C. Hatton, on page 331.

"Sewage Disposal," by J. N. McClintock, on page 335.

"Losses in Underground Municipal Structures," by A. P. Folwell, on page 339.

"A Municipal Laboratory for Testing Asphalt and Cement," by W. H. Broadhurst, on page 342.

"The Bitulithic Pavement," by Fred J. Warren, on page 347.

STREET COMMISSIONER, F. J. O'BRIEN, OSWEGO, N. Y.
Treasurer A. S. M. I.

"Concrete Pavements in Toronto, Can.," by C. H. Rust, on page 350.
"Tests for Wood Paving Blocks," by F. A. Kummer, on page 351.
"The Municipal Asphalt Plant at Winnipeg, Man.," by H. N. Ruttan, on page 354.
"Methods of Making Assessments for Public Improvements in Toronto, Ont., by C. H. Rust, on page 355.
"The Influence of Commercial Organizations Upon Municipal Improvements," by Charles Carroll Brown, on page 356.
"The Use of Sulphur for Sewer Pipe Joints in Wet Trenches," by E. S. Rankin, on page 357.

The League of American Municipalities.

The eighth annual convention of the League of American Municipalities was called to order in the auditorium of the city hall in East St. Louis, Ill., at 10 o'clock Tuesday morning, Oct. 4, and heard an address of welcome by Mayor Silas Cook and the president's address by James M. Head, ex-Mayor of Nashville, Tenn.

Mayor Cook laid before the delegates an attractive program of entertainment

MAYOR W. C. CROLIUS, JOLIET, ILL.
President L. A. M.

in addition to the business sessions of the convention, which included a visit to the filter plant of the city water works Tuesday noon, attendance informally on the Veiled Prophets' parade Tuesday night and a banquet at the exhibition of the Hale Fire Fighters on the St. Louis Exposition grounds followed by a special performance of the methods and apparatus for fire extinction and life saving.

President Head in mentioning propositions for affiliation of the various organizations devoted to municipal improvement said:

COUNCILMAN JOSEPH E. McCAFFERTY, WILMINGTON, DEL.
Vice-President L. A. M.

Certain it is that no organization can permanently and materially benefit or improve municipal governments which does not secure for its membership those public officials who for the time being have in charge the actual management and direction of municipal work. In other words fine spun theories, learned papers, resolutions and petitions of committees are all helpful, but without the active interest and co-operation of those actually in charge, no very great practical results will ever be accomplished. In fact those intrusted with authority are apt to regard suggestions and demands from those outside as actuated by some other than purely disinterested motives and frequently will not give to them that serious consideration to which they are fairly entitled. That feeling which makes the mother crow believe her young the whitest, exists in the hearts of all human beings, and a suggestion which does not in a measure at least originate with the party whose duty it is to put it into practical operation will never receive that earnest support which is necessary to make it effective.

When, however, the members of different municipal governments meet in

annual convention, and in the course of a week's mingling and interchange of views, and each representative boasting, as they will do more or less, of that which is best in their respective municipal governments, the effect upon officials of other governments will be the very best possible, and they will return to their respective homes determined, if possible, to work out for their cities

JOHN MacVICAR, DES MOINES, IA.,
Secretary L. A. M.

something in the way of good that other officials have done for their cities. It is for these reasons largely that the League of American Municipalities can, and in my judgment is, doing more genuine practical work in the way of improving municipal conditions than it is possible for any other organization to accomplish.

At the same time it must be admitted that the organization lacks something of that stability and fixedness of purpose, owing to the constant change of its membership, which other similar organizations possess. After a patriot has faithfully served his constituents for a number of years, at so much per, and finds all his ideal dreams and disinterested schemes for the public good ruthlessly pushed aside and held up to public ridicule by some other self-sacrificing patriot, the zeal of that ex-official in pure government, retrenchment and reform, and the municipal ownership of all public utilities is materially dampened. His future attendance upon meetings of the league at his own expense, and the preparation of exhaustive papers upon theories that he was denied the privilege of putting into practical operation will become irksome and even a burden which few of us will have the courage to undertake.

He called special attention to the growing belief that cities should govern themselves and pointed out some of the serious consequences of the present system of government of cities by State Legislatures.

It is not difficult, then, to understand why it is that our cities are the worst governed in the world, since they are governed largely by those who have no part in footing the bills. It is no wonder that valuable and perpetual franchises have been given away for the asking or paid for to those who had no right to sell.

The political boss came in for his share of execration because of his irresponsible nature, the iniquities of which he is the source and the difficulty of reaching him effectively.

It is the business of this League to destroy the political boss, to arouse and maintain in the public a lively interest in all questions of city government, to keep constantly before the minds of the people the great advantages to be obtained from local self-government, to educate the public in all matters pertaining to good city government and arouse in the

MAYOR W. S. MORGAN, GEORGETOWN, S. C.,
Treasurer L. A. M.

minds of all city officials an earnest desire to do something of benefit to the city with which they are connected.

The reports of the Secretary and Treasurer showed considerable balance on hand, a very satisfactory change from the condition of debt under which the League labored for several years. The

services of the Secretary have been so satisfactory in putting the League on its feet financially and the necessity of at least one permanent official is so evident, that the executive board made a report recommending that Mr. John MacVicar be retained in his office, that he spend practically all his time in the work and that he be paid a salary of $2,400 a year, provided the receipts from dues are sufficient to cover it. The Secretary has issued monthly bulletins for a part of the past year and they were commended as a frequent means of communication with the membership. The recommendations of the committee included one that the publication of these bulletins be authorized provided they cost the League nothing, the presumption being that the publication will at least pay for itself. Copies of the bulletin are to be sent to all officials of cities which are members of the League. These recommendations were approved after some discussion. History does not always repeat itself and possibly under the present management this arrangement will be more satisfactory than similar propositions have been in the past.

Mr. Morrell Vrooman, City Engineer of Gloversville, N. Y., read a paper on sewage disposal, extracts from which will be given later, space not permitting the publication of all the society proceedings this month.

A good share of the afternoon was spent in visiting the water filtration plant of the city of East St. Louis and inspecting the operation of the fire department and the methods of street cleaning. The evening was left free for the delegates to attend the parade and ball of the Veiled Prophet, which are famous annual events in St. Louis.

Wednesday was filled with addresses by different delegates and discussions on various civic improvements, the program including L. N. Case on the operation of a municipal gas plant, J. F. O'Brien on special assessments, M. N. Baker on refuse destructors and J. F. Dornhoff on competition in telephone service and some of its results.

Officers were also elected as follows:

President, Mayor William C Crolius, Joliet, Ill.

First Vice-President, Mayor R. Y. Rhett, Charleston, S. C.

Second Vice-President, George Stewart Brown, Baltimore, Md.

Third Vice-President, Joseph D. McCafferty, Wilmington, Del.

Secretary, John MacVicar, Des Moines, Ia.

Treasurer, Mayor William D. Morgan, Georgetown, S. C.

Trustees, Commissioner Henry Bohl, Columbus, O.; Mayor William M. Drennan, Birmingham, Ala.; Mayor Silas Cook, East St. Louis, Ill.; Mayor M. H. Krouse, Kokomo, Ind.; Comptroller Louis Betz, St. Paul, Minn.; Mayor James Baker, Lockport, N. Y.

The convention was greatly enlivened by the strenuous, though friendly, contest of Columbus and Toledo, O., for the next meeting, the former finally sesuring the majority vote of the delegates.

On Thursday morning the members gathered at the East St. Louis headquarters and proceeded to the joint meeting on the Exposition grounds, after which they proceeded to the restaurant of the Hale Fire Fighters for a banquet and an exhibition as the guests of the local committee. About 250 delegates and guests participated.

Several of the papers presented will be given in later numbers of Municipal Engineering.

Civic Day at the St. Louis Exposition.

A civic week was proposed for the St. Louis Exposition in June, but the insufficient advertising and the unfinished condition of the "Model Street," in the "Town Hall" of which the meetings were to be held, caused a postponement. The meeting of several societies interested in civic improvement the same week caused an effort to secure one or two joint sessions for the consideration of subjects common to all the societies. Such a joint program was arranged by the National Municipal League, the League of American Municipalities, and the American Civic Association, but the program committee of the American Society of Municipal Improvements did not deem it expedient to join in the session.

Papers on the aims and accomplished work of various organiaztions were presented, ex-President James M. Head speaking for the League of American Municipalities, Secretary Clinton Rogers Woodruff for the National Municipal League, and Vice-President Charles Carroll Brown unofficially for the American Society of Municipal Improvements. Full abstracts of these three addresses are given elsewhere in this number of Municipal Engineering.

Other papers were presented as follows

"The Civic Problem Discussed From a

Civil Service Point of View," by Charles Noble Gregory, dean of Law School, Iowa State University.

"The Civic Problem from a Legal Point of View," by Amasa M. Eaton, president of the Providence, R. I., Municipal League.

"The Civic Problem from the Sociological Point of View," by Prof. L. W. Howerth, University of Chicago.

"The Suppression of Epidemic Diseases," by Dr. John H. Simon, Health Commissioner of St. Louis.

The presiding officer was John A. Butler of Milwaukee, Wis., who discussed to some extent in his opening address the practices and abuses in nominations and elections of municipal officers.

Mrs. Conde Hamlin of St. Paul, the hostess of the "Twin City" building on the model street, described the various municipal exhibits on the street and elsewhere, showing that, while the original idea had not been fully carried out, there were many interesting and valuable things to be seen and lessons to be drawn.

The proceedings of the meeting will probably be published by both the National League and the League of American Municipalities.

Association of Cement Users.

While there was no meeting of the proposed Association of Cement Users at St. Louis, the gathering of a number of persons interested in the use of cement in St. Louis during the week of the Engineering Congress and other engineering and municipal societies, led to an informal meeting for the discussion of the question of the formation of such a society. The report in the October number of Municipal Engineering of the responses to letters and editorial articles regarding the need of such an association was before the meeting and the general tone of the replies was so enthusiastically favorable that steps were taken to make the first meeting a success in every respect.

The votes in the letters for time and place were largely in favor of January and a city of the Central West, and therefore Jan. 17, 18 and 19 and Indianapolis, the leading city in the vote, were definitely fixed upon.

It was decided to secure competent persons to open discussions upon the subjects of the qualities and tests for cement, methods of mixing mortar and concrete, the effect of various proportions of water, qualities of materials for concrete, methods of making cement blocks and artificial stone, strength of concrete blocks, bricks and monolithic, colors for mortar and concrete, etc. Some of these speakers have already been secured, including Mr. R. L. Humphrey of Philadelphia, Prof. W. D. Pence of Purdue University, Lafayette, Ind.; J. W. Lane, Carthage, Mo., and others less definitely engaged.

The program is not yet completed and is open to suggestions as to subjects and speakers.

Local entertainment promises to consist of banquet, smoker and visits to points of interest that those attending the convention may have full opportunity to become personally acquainted. The various firms interested in supplying cement, concrete mixers, cement workers' tools, concrete block machines, etc., will be invited to exhibit their materials and machinery and will be supplied with the proper facilities.

The persons and committees set to work promise to do good work and those interested in the formation of the association may rest assured that the first meeting will be well worth the time and money they may spend in attending it.

Mr. Charles Carroll Brown, Consulting Engineer, 408 Commercial Club Building, Indianapolis, Ind., is in charge of the local arrangements and the center of communication regarding program and will reply to any letters of inquiry or advice.

The National Brick Manufacturers' Association.

About 200 members of the National Brick Manufacturers' Association held an informal convention Oct. 5, 6 and 7, as elsewhere outlined. The local committee having in charge the entertainment features, which constituted practically all the proceedings, consisted of Lemon Parker, chairman; Anthony Ittner, R. D. Hatton, C. M. Fitzhugh, G. C. McNeil, Eb. Rogers, R. F. Grady, Fred Talbot, W. G. Eliot, G. J. M. Ashby, J. M. Williams, S. Geijsbeck, H. A. Wheeler, secretary and treasurer; G. C. Stoll, J. Carmichael and W. N. Graves.

The officers are: William Purington, Galesburg, Ill., president; J. M. Blair, Cincinnati, O., first vice-president; W. P. Blair, Terre Haute, Ind., second vice-president; A. R. Root, Princeton, N. J., third vice-president; J. W. Sibley, Bir-

mingham, Ala., treasurer, and T. A. Randall, Indianapolis, Ind., secretary.

The annual convention will be held in Birmingham, Ala., in February.

The International Engineering Congress.

According to various authorities the second or the fifth international engineering congress was held in St. Louis Oct. 3 to 8, inclusive, under the auspices of the American Society of Civil Engineers. The first great congress of engineers was held in Chicago in 1893 and several smaller congresses, more or less local in character, have been held at other expositions. The last is the greatest and most successful.

The Chicago congress was supported by a number of societies, representing all branches of engineering, while but one society was responsible for the St. Louis congress. Perhaps on this account the most emphasis was laid on what are usually termed civil engineering questions and fewer papers on mechanical, electrical, mining and other branches of engineering were presented. This is true notwithstanding the fact that the American Society of Civil Engineers is the parent engineering society in this country and has representatives in its membership of all branches of engineering, but the proportion of papers presented is roughly proportional to the distribution of members, though a large percentage of them were from foreign engineers and men not members of the society, chosen on account of their prominence in their special lines.

The introductory general session on Monday morning, Oct. 3, had the usual addresses of welcome and responses. One of the most notable of the latter was from Sir William H. White, the president of the British Institution of Civil Engineers, who was the first offical representative of his association to any engineering congress. Brief addresses were given by representatives of French, German, Russian, Austrian and Argentine Republic engineers and societies.

The congress divided into sections for the next four days and heard abstracts of papers and entered into discussions of the same, most of which were very interesting and extremely valuable. The papers were distributed over the first three days and the fourth day was left open for discussions, which were not completed on the days set for them. There were several such discussions for the eight sections held twenty-eight sessions in the four days.

The second section was the municipal section and its three days were devoted to three problems of municipal engineering, water purification, sewage disposal and garbage destruction. The papers by Allen Hazen of New York, M. Bechmann of the Paris water department, Adolph Kemna of the Antwerp waterworks and J. M. K. Pennik of Amsterdam will receive fuller treatment later. The papers of Wednesday were by George W. Fuller and M. Bechmann, the former giving statistics of American sewage disposal systems. Mr. Rudolph Hering presented the paper of Wednesday on the disposal of municipal refuse.

The fourth section on materials of construction was the most largely attended. Robert W. Lesley gave statistics of American cement manufacture in the last paper on Tuesday. Concrete and concrete-steel were the subjects on Wednesday, the papers being by Edwin Thacher, John S. Sewell, F. von Emperger, Armand Considere and J. J. L. Bourdrer, all names carrying great weight in a discussion of these subjects. Tests of steel, timber and cement were considered on Wednesday, W. A. Aiken of New York and Edward Candlot of France treating of cement and Prof. G. Lanza of Boston of timber.

The eighth or miscellaneous section included in its list irrigation, with papers by Elwood Mead, M. M. O'Shaughnessy of California, Paul Salvador of France and J. de Meyier, formerly of Java, and highway construction, with papers by James Owen of New Jersey, W. E. McClintock of Massachusetts, G. Forestier of France, R. J. Thomas of England and H. P. Gillette of New York. All these papers will be more adequately treated when space permits.

Other sections considered waterways, railroads, mechanical, electrical, military and naval engineering.

The final session was held Saturday morning, when it was learned that ninety-eight papers had been presented, seventy-eight written discussions of them and 272 oral discussions. The enrollment was 861 members and visitors and the total membership of the congress is between 1,400 and 1,500. The volumes of proceedings will contain about 3,500 pages. The session closed with farewell speeches

from engineers of Great Britain, Sweden, Switzerland, Austria, Russia, Holland and Japan.

The social features included a reception at the English building on Wednesday afternoon and a smoker, given by the St. Louis Engineering Club at the Missouri building on Friday night. The club also distributed a very handsome souvenir volume of 180 pages containing an engineering guide to the Exposition grounds and a full guide to the engineering features of St. Louis and vicinity, which is, in addition, a valuable compendium of statistics.

WATER AND SEWERS

Columbus, Ga., Water Works—Eight-Hour Law—Rogers Park Water Rates—Knoxville Water Works—Pawtucket Sewage Disposal.

Recommendations in Columbus, Ga., Water Works Case.

The report of the Master in Chancery in the United States Court, Hon. Henry R Goethius, in the water works case of Columbus, Ga., was submitted to the attorneys on both sides Oct. 16. In many respects the report of the Master is considered a victory for the city, with the exception of one particular, and if this feature is sustained the bondholders of the Columbus Water Works Company will triumph.

The company's service became so unsatisfactory two years ago that the citizens of Columbus voted the issue of $250,000 bonds with which to construct a municipal system of water works. The bondholders of the Columbus Water Works Company then filed in the United States Court a petition asking the court to restrain the city from issuing bonds, claiming that it could not legally do so under the contract with the company. The city claimed that the contract was null and void, because of the company's failure to comply with it. Judge Newman referred the case to the Master in Chancery, and at the hearing, several months ago, both sides introduced a great amount of testimony.

In his report to the court the Master recommends that the contract between the city and the Columbus Water Works Company be rescinded and declared annulled, and that the city be permitted to construct water works of its own. As a matter of equity the Master recommends that the city be required to purchase the distribution system in the city of Columbus of the Columbus Water Works Company for the sum of $176,562. This includes the pipes and filter plant. The city does not object to the purchase, but thinks that $176,562 is not an accurate valuation, and will take exceptions to the findings of the court on that point.

Eight-Hour Law Unconstitutional in Wisconsin.

In a decision handed down by Judge Halsey, at Milwaukee, Wis., Oct. 11, the eight-hour law is declared illegal. He holds that the restrictions inserted in the advertisement for bids on the pumping engine for the water works pumping engine, the contract for which was awarded to the William Tod Company of Youngstown, O., lessened and restricted the number of bids and increased the price by many thousands of dollars.

The Filer-Stowell Company of Milwaukee brought suit against the city of Milwaukee and the William Tod Company, claiming that the contract for the pumping engine had been wrongfully let, inasmuch as the bid of the Filer-Stowell Company had been lower by several thousand dollars. In the eight-hour clause, however, the Filer-Stowell Company did not come up to requirements. Judge Halsey's decision is as follows:

I am of the opinion that the limitation in the resolution of the common Council, adopted June 13, 1904, and inserted in the advertisement for bids for the work in question, lessened and restricted the number of bids, and increased the price by

many thousands of dollars, and is in direct violation of sec. 10, chapter 5, of the city charter, which requires that all contracts shall be awarded to the lowest bidder. Let judgment be ordered as prayed for.

Rogers Park, Chicago, Water Rates Are Reasonable.

In a decision handed down by the Appellate Court at Chicago, Oct. 4, the right of the Rogers Park Water Company to enforce its existing rates in that suburb is sustained, and the decision of Judge Baker in the lower court two years ago is affirmed. When Rogers Park was annexed to Chicago it brought with it its own water system, the rates of which were higher than those of the city. The Council passed an ordinance reducing these rates to equal those in the rest of the city. The company asserted its rates had been established by a contract. The city won on this point, as the Supreme Court held that the municipality had the right to fix the rates, no matter what the franchise ordinance said, providing those rates were reasonable. On the next hearing the company contended its rates were reasonable. In his opinion, Judge Adams says the company never has earned more than 3 per cent, that its management is economical, and that it would be unfair to reduce its rates, as the territory is sparsely settled. Judge Adams holds that the city can extend its mains and compete.

Public Spirited Officials of Dixon, Ill.

The city of Dixon, Ill., is without working funds, and in order to keep the streets clean Mayor Edwards has donated his salary of $500 a year and each of the ten aldermen his salary of $72 a year. The business men of the city are also subscribing for this purpose.

Knoxville, Tenn., Can Build Water Works.

In an opinion handed down by United States Judge C. D. Clark in the Knoxville Water Company's case, in which he dismissed the bill to enjoin the city of Knoxville, Tenn., from issuing $150,000 bonds for the erection of a water works plant, he first held that the Federal Court has jurisdiction in the case. He also holds that the erection of water works by a municipal corporation in the State of Tennessee for the purpose of supplying itself and the inhabitants of the city within the corporate limits with water, is one of the ordinary powers of a municipal corporation, and needs no enabling act to authorize the exercise of such a power.

Decision in Pawtucket Sewage Disposal Case.

The United States Circuit Court for the Rhode Island District recently made a decision in the case of the American Sewage Disposal Company vs. Pawtucket, R. I., for infringement of Glover's patent, No. 559,523, for sewage purification apparatus. The closing paragraphs of the decision are as follows:

In my opinion, the patent does not, either directly or by fair implication, describe or claim the combination of putrefactive and oxidizing processes, nor the use of putrefactive action to reduce sludge; nor does it describe primary tanks suitable or intended for the production of this action to any substantial extent. There rests upon the defendant no burden to prove a complete absence of any degree of liquefying action in the primary filter beds, but, on the contrary, the complainant's argument requires it to prove that the primary filter beds, with the described straining action, are the equivalent of a proper septic tank designed for the retention of a substantial amount of liquid and the sludge for such time as to develop a proper putrefactive action. This, in my opinion, the complainant has failed to do. If the structure of the patent in suit is capable of two distinct modes of use, one involving invention and one not, it is incumbent upon the patetee to point out that mode of use which involves invention. In this patent the suggestions as to the mode of use rather point to rapid straining and oxidation than to intended putrefactive action for the purpose of liquefying the solids.

In my opinion, the defendant does not infringe for the reason that it does not have the element of the claim, "a series of stationary primary filter beds" "constructed to discharge the effluent wholly through filtering material," nor any equivalent therefor which will perform the function of filtering the sewage to separate the solids and liquids. The use of putrefactive action to liquefy solids is not an infringement of anything described or claimed in the patent or proved to be substantially involved in any operation of the patented structure intended by the patentee. It does not seem necessary or useful to consider the defense of anticipation of the claim as construed by the complainant, since I am of the opinion that the complainant's construction of the claim is unsound; nor do I consider it necessary to consider the legality of the transfer to the complainant of the title to the patent.

The bill will be dismissed.

PAVING AND BUILDING CONSTRUCTION

Injunction Against Bitulithic Denied—City not Liable for Special Assessment Bonds—Lehigh Cement Rock—Sand-Lime Brick.

Injunction Against Nebraska Bitulithic Contract Denied.

The application of W. G. Ure for an injunction to restrain the city of Omaha, Neb., from carrying out a contract with the Nebraska Bitulithic Company for the paving of S. Thirty-second-st. was denied Oct. 15, by Judge Troup. The decision was based on three grounds:

First—That it was proper to pay for the paving out of the intersection fund, and not out of the park or any other fund.

Second—That the Board of Public Works is authorized to draw paving specifications.

Third—That the paving specifications in question were legal.

Regarding the legality of the specifications, Judge Troup said:

I am forced to declare that the specifications are legal. If I could be convinced that there was anything in them which would permit the board to favor a friendly contractor and injure a rival contractor, I would declare them illegal.

On the matter of the good faith of the Board of Public Works, it is in evidence here that the majority of the board accepted a free trip to St. Louis and entertainment there at the expense of the Nebraska Bitulithic Company, when the members knew that they would soon be called upon to act on a bid from that company. Such conduct was a matter of exceedingly doubtful propriety, to say the least.

It is further in evidence that the majority of the board consulted only with Hugh Murphy and John Grant on the matter of paving specifications, and with one exception consulted with no other contractor; that the board refused the advice of the city attorney, but, seeking no other legal counsel, accepted the advice of Mr. Murphy and Mr. Grant.

While the specifications are not illegal, it would have been much better had the advice of City Attorney Wright been followed. That advice was good and would have removed any possible doubt about the specifications.

In spite of any possible bad faith on the part of the board, I cannot find that it was impossible for a contractor to get fair treatment under these specifications.

The Cement-Rock Deposits of the Lehigh District.

The "Lehigh district" of the engineer and cement manufacturer has been so greatly extended in recent years that the name is now hardly applicable. It originally included one small area, four miles square, located along the Lehigh river, partly in Lehigh County and partly in Northampton County, Pa., which contained the villages of Egypt, Coplay, Northampton, Whitehall and Siegfried. The cement plants which were located here at an early date secured control of most of the cement-rock deposits in the vicinity, and plants of later establishment have therefore been forced to locate farther and farther away from the original center of the district. At present the district includes parts of Berks, Lehigh, and Northampton Counties, Pa., and Warren County, N. J., reaching from near Reading, Pa., at the southwest to a few miles north of Stewartsville, N. J., at the northeast. It forms, therefore, an oblong area about twenty-five miles long from southwest to northeast, and about four miles wide. Within this area about twenty Portland cement plants are now in operation, and the Portland cement produced in this relatively small district amounts approximately to two-thirds of the entire United States output. The cement rock deposits and cement industry in the Lehigh district were studied during the summer of 1903 by Mr. Edwin C. Eckel, of the United States Geological Survey. His conclusions are embodied in a paper entitled "Cement-Rock Deposits of the Lehigh District of Pennsylvania and New Jersey," which is included in the Survey's bulletin No. 225, "Contributions to Economic Geology, 1903."

Throughout most of the Lehigh district the practice is to mix with a relatively large amount of the "cement rock," or argillaceous limestone, a small amount

of pure limestone in order to bring the lime-carbonate content of the mixture up to the percentage proper for a Portland cement mixture. In the plants located near Bath and Nazareth, however, the practice has been slightly different. In this particular area the cement rock quarries usually show rock carrying from 75 to 80 per cent of lime carbonate. The mills in this vicinity, therefore, require practically no pure limestone, as the quarry rock itself is sufficiently high in lime carbonate for the purpose. Indeed, it is at times necessary for these plants to add clay or slate, instead of limestone, to their cement rock in order to reduce its content of lime carbonate to the required figure.

The cement rock is a dark gray to black, slaty limestone, breaking with an even fracture into flat pieces, which usually have smooth, glistening surfaces. As the percentage of lime carbonate in the rock increases the color becomes a somewhat lighter gray, and the surfaces of the fragments lose their slaty appearance. The pure limestones added to the cement rock are commonly gray, and break into rather cubical fragments. The fracture surfaces show a finely granular structure, quite distinct in appearance from the slaty cement rock. In composition the limestones commonly used will carry from 90 to 96 per cent of lime carbonate, with rather less magnesium carbonate than is found in the cement rock.

Superior, Wis., Not Liable for Bonds Payable by Special Assessments.

The United States Circuit Court of Appeals in Chicago has handed down a decision in the case of Harry L. Jewell of Chicago against the city of Superior, Wis., to recover about $15,000 on special improvement bonds, together with interest since 1901, making the total amount about $17,000. The court holds that the holders of these bonds could collect from the city only the amount that had been actually paid to the city itself on the special assessments of property benefited by the improvement, less the amount of money paid by the city as interest on the bonds in the last few years. The court found that the actual amount of money collected by the city on the assessments for these special improvements and for the payment of the bonds had been $3,000, and this was all for which the court would give the plaintiff judgment, and from this was deducted the amount of interest that the city had paid on the face value of the bonds since they were issued. The plaintiff claims that in any event he had a right to collect from the city for the full amount of his claim, as he was the only one then bringing suit. The court decided against him on this proposition, too, as well as every point of the decision of the lower court.

The plaintiff still has the right, however, to bring suit against the county. Large numbers of the assessments went delinquent with other taxes at a time when the boom in that city collapsed, and since that time the County Board has settled many of them at less than face value, and for almost nothing in some cases. The court holds that the city cannot be held for these and the only recourse is to sue the county.

The Sand-Lime Brick Industry.

A paper written by S. V. Peppel on the sand-lime brick industry has recently been published by the United States Geological Survey.

There are in this country at present about fifty plants, with a total capacity of approximately 1,000,000 bricks a day. The experience of these plants indicates that sand-lime brick can usually be manufactured at a cost below that of common clay brick. When, however, a sand-lime brick is desired equal to the fine clay front brick the cost of production is naturally increased beyond that of common clay brick. Sand-lime bricks have been in use long enough, both in this country and in foreign countries, to prove that when properly made they have sufficient strength and sufficient water and weather-resisting qualities to make them a safe building material.

The commercial development of the industry dates back only fifteen years in foreign countries and not more than four years in the United States. In 1896 Germany had only five factories where sand-lime brick was made, but now it has about 200, with an actual annual output of between 350,000,000 and 400,000,000. Early in 1901 a plant was built in Michigan City, Ind. In 1902 about twenty plants were in existence and 6,000,000 bricks were actually sold. Full and accurate data are not obtainable as to the actual output in 1903, but about 20,000,000 bricks have been reported as sold in that year. Many of the factories had just started and were not manufacturing to their full capacity during the year.

ORGANIZATIONS AND INDIVIDUALS

Hagloch's Books—Civil Service Examinations—Technical Meetings—Personal Notes.

Hagloch's Books on Artificial Stone Construction.

More complaints of non-receipt of books ordered from F. W. Hagloch of Cleveland, O., in cases where money has been forwarded to him have been received during the past month. On Oct. 24 a letter was received from him promising to forward copies of "Art Stone" to fill orders, and the books have come to hand and will be forwarded to those who have ordered the books of us.

The letter gives no information regarding the publication of "Concrete Dwellings." Attention of the Postoffice Department has been called to the complaints. If any of our readers, having forwarded money with their orders for these books, have not received the books and have not yet notified us of this fact, they may do so and their letters will be held for the information of the Postoffice Department.

U. S. Civil Service Examinations.

Examinations will be held on Nov. 22 and 23, 1904, at the usual places for drainage engineer in the irrigation and drainage investigations in the office of experiment stations, United States Department of Agriculture, with initial salaries of $1,500 to $2,000 a year; on Nov. 29 and 30 for civil engineer and superintendent of construction in the quartermasters' department at large at $1,500 a year; on Nov. 30 for scientific assistant in the bureau of fisheries at $720 a year; and Dec. 7 and 8 for constructing engineer in the United States powder depot at $200 a month.

Technical Meetings.

The annual meeting of the American Society of Mechanical Engineers will be held in New York City, Dec. 6. F. R. Hutton, sec'y, 12 W. Thirty-first-st., New York City.

The annual convention of the American Railway Mechanical and Electrical Association was held in the reading room of the Transportation Building at the St. Louis Exposition, Oct. 10 and 11. Some of the papers submitted were: "The Ideal Shop," W. D. Wright, superintendent of equipment of the Rhode Island Company, Providence, R. I.; "Car Wheels," J. Millar, superintendent of rolling stock of the International Railway, Buffalo; "Maintenance and Inspection of Electrical Equipment," John Lindell, general foreman of shops of the Boston Elevated Railway. Officers were elected as follows: President, C. F. Baker, Boston; vice-presidents, H. H. Adams, Baltimore; John Millar, Buffalo, F. D. Simmons, Milwaukee; secretary and treasurer, S. W. Mower, Detroit, Mich.

The annual meeting of the American Gas Light Association was held at the Willard Hotel, Washington, D. C., Oct. 19 to 21. Papers were submitted as follows: "Generation of Steam by Waste Heat from Gas Sets," D. McDonald, Louisville, Ky.; "Distributing Power in a Gas Works by Means of Electricity Generated at a Central Point," W. A. Baehr, St. Louis, Mo.; "Oxide Purification," E. H. Earnshaw, Philadelphia, Pa.; "Methods of Charging for Gas," F. W. Frueauff, Denver, Colo.; "Consumer's Meters," B. H. Spangenberg, Philadelphia.

The nineteenth annual convention of the National Brick Manufacturers' Association will be held at Birmingham, Ala., Feb. 6 to 11, 1905.

The first annual meeting of the Michigan Electric Association was held in Detroit, Mich., Oct. 10, 11 and 12. Some of the papers submitted were as follows: "Steam Economics," Prof. John R. Allen of the University of Michigan; "Water Power," Prof. G. S. Williams, University of Michigan; "The Nernst Lamp as a Factor in Commercial Lighting," E. R.

Robert of Pittsburg; "Economies in the Practice of the Incandescent Lamp," F. W. Wilcox of the General Electric Company of Harrison, N. J. Officers were elected as follows: President, E. F. Phillips, Detroit; vice-president, W. A. Foote, Jackson; secretary and treasurer, J. E. Davidson, Port Huron.

The seventh annual meeting of the League of Iowa Municipalities met at Cedar Rapids, Ia., Oct. 13.

The twenty-third annual convention of the American Street Railway Association was held in the Transportation Building, Louisiana Purchase Exposition, Wednesday and Thursday, Oct. 12 and 13.

The present membership is 196; balance on hand, $7,646.56.

Officers were elected as follows:

President—W. Caryl Ely, Buffalo, N. Y.

First Vice-President—Elwin C. Foster, New Orleans, La.

Second Vice-President—John I. Beggs, Milwaukee, Wis.

Third Vice-President—Richard McCulloch, St. Louis, Mo.

Secretary and Treasurer—T. C. Penington, Chicago, Ill.

Executive Committee—The officers and John J. Stanley, Cleveland, O.; Howard F. Grand, Seattle, Wash.; C. G. Goodrich, Minneapolis, Minn.; F. G. Jones, Memphis, Tenn.; W. E. Harrington, Camden, N. J.

The following officers were elected at the convention of the International Association of Municipal Electricians, held at St. Louis, Mo., September 14:

President—W. M. Petty, Rutherford, N. J.

First Vice-President—J. B. Yeakle, Baltimore, Md.

Second Vice-President—G. H. Holderman, Indianapolis, Ind.

Third Vice-President—C. E. Diehl, Harrisburg, Pa.

Fourth Vice-President—Charles Greenwald, New Brunswick, N. J.

Treasurer—G. F. Macdonald, Ottawa, Canada.

Secretary—F. P. Foster, Corning, N. Y.

Executive Committee—J. Murphy, Cleveland, O.; Wm. Crane, Erie, Pa.; M. J. Donohue, Niagara Falls, N. Y.; A. S. Hatch, Detroit, Mich.; C. L. Williams, Laurel, Miss.; A. C. Farrand, Atlantic City, N. J.; W. H. Thompson, Richmond, Va.; F. C Mason, Brooklyn, N. Y.; J. S. Craig, Toronto, Canada.

Finance Committee—W. H. Bradt, Troy, N. Y.; James Grant, New Haven, Conn.; T. C. O'Hearn, Cambridge, Mass.; J. D. Hall, Peoria, Ill.

Next place of meeting, Erie, Pa.

Personal Notes.

S. S. Feeter has been appointed city engineer at Little Falls, N. Y.

Edward Elbert has been appointed president of the water board at Reading, Pa.

Hon. George Walker, ex-Mayor of Portland, Me., died Oct. 7, aged eighty-five years.

H. B. Kirkpatrick has been appointed instructor in civil engineering in Syracuse University.

Wallace Greenalch has been appointed superintendent of the bureau of water, at Albany, N. Y.

Walter A. McDonald, county surveyor of Chester County, Pa., died at his home in West Chester, Pa., Oct. 10.

Owen Burns, town clerk of Harmon, Ill., was instantly killed Oct. 1, by a Chicago, Burlington & Quincy train.

F. E. Pritchard, superintendent of the municipal electric and water plants at Fairport, N. Y., has been appointed village engineer for the ensuing year.

G. L. Sawyer has resigned as assistant city engineer at Champaign, Ill., to accept a similar position at Boise City, Idaho.

Adolph G. Wulff has taken charge of interests of the Trussed Concrete Steel Company in the vicinity of Cincinnati, and will have offices at 2800 Euclid-ave., that city.

The Robert F. Wentz Engineering Company, ltd., has closed its offices at Nazareth, Pa., and Toronto, Canada, and has opened an office at 508 Hammond building, Detroit, Mich.

Abraham U. Whitson, a graduate of the College of Civil Engineering of Cornell University, has been made a member of the staff of Morris Knowles, chief engineer of the bureau of filtration, Pittsburg.

Arthur W. Tidd has resigned as assistant engineer with the Charles River Basin Commission, of Boston, to accept a position as assistant engineer with the Croton Aqueduct Commission, New York City.

Harrison Souder has established an office at 303 Harrison building, Philadelphia, and will make a specialty of water and sewerage works, hydraulic works, hydraulic power development and steel and concrete structures.

E. Von der Osten, 9 Toronto-st., Toronto, Ont., is consulting engineer for the Toronto Paving and Construction Co., and the Southern Light and Power Co. He has had wide experience in concrete construction and municipal work in Germany and America and is now investigating a failure of concrete work on the Richelieu river in Quebec.

M. S. Ketchum, Kansas City, Mo., has been elected professor of civil engineering at the University of Colorado at Boulder. Mr. Ketchum has been connected with the American Bridge Company, with headquarters in Kansas City, during the last year, and prior to that time was assistant professor of civil engineering in the University of Illinois.

O. L. Remington is in this country on behalf of Messrs. William McLean & Co., of Melbourne, Australia, contracting and electrical engineers, who represent the Allis-Chalmers-Bullock Company. The

firm is interesting itself in municipal engineering and desires to become conversant with American practice. Mr. Remington can be addressed while in this country in care of M. Remington, Brownsville, Ind.

James B. Cottom, president and general manager of the Cottom Artificial Stone and Manufacturing Company, Dayton, O., died suddenly Oct. 13 at his home in that city.

Mr. Cottom was one of the pioneers in what has so recently become a great industry, the manufacture of cement blocks. He was one of the earliest patentees not only on certain features of his "Cottom" block, but also on the "Cottom" machine. His home in which he died was built of artificial stone blocks over four years ago and is a standing mounment to the merits of the blocks. Earlier in life he had patented a self-operating gate, which was widely used throughout the country. Mr. Cottom was about sixty-five years old when he died. He was well and favorably known in Dayton, where he had spent his whole life, and had a large circle of friends.

MACHINERY AND TRADE

Smidth Tube Mills for Sand-Lime Brick Plants.

In reply to the inquiry in Municipal Engineering, vol. xxvii, p. 118, for makers of sand-lime brick machinery, F. L. Smidth & Co., 41 Cortlandt-st., New York City, call attention to some of their machinery as applicable to the manufacture of this product, such as tube mills for pulverizing and mixing.

A Church of Hollow Concrete Building Blocks.

The congregation of the Howard Memorial Church, Kansas City, Mo., appointed a committee in the spring of 1904 to investigate the different building materials for their new church, and after due consideration decided on the hollow cement building block and awarded the contract for blocks and trimmings to the Granilite Manufacturing and Construction Company of Kansas City.

The building rests on a native limestone foundation and everything above the ground line is cement blocks. The walls are eighteen inches thick up to the water table. They are then sixteen inches up to where the large window arch springs, whence the wall continues to the peak of the gables with twelve-inch blocks. The blocks are nine by thirty-two inches, pitch face, alternating every other course with six by thirty-two inches, making a very pretty wall, which does not have the "jail" effect of nine-inch courses alone.

The church plan measures seventy by seventy feet with an extension on the south side of thirty feet, which is the old church veneered with cement blocks, continuing and joining the new building without break. The gables are fifty-six feet high and the tower will be sixty-five feet when completed.

The water table, sills, belt courses, arch blocks, gable blocks and coping are finished with a very white ground stone.

This is the first hollow block building erected in Kansas City. It is on a prominent corner on one of the Parkway boulevards and has a very handsome and striking effect. It will be completed about the middle of December.

The blocks were made on the "Chicago" machine and some of them were put in the wall when less than ten days old.

The Granilite Company was organized in the spring and has been working ten hours a day all season. Most of the work has been range and broken ashlar veneer window sills, caps, water tables and all kinds of trimmings.

All their material is mixed in a Smith mixer and is water-proofed before going into the wall.

Callender's Bitumen Damp Course.

Mr. T. Hugh Boorman, American Agent of the Geo. M. Callender & Co., Ltd., has lately returned from a trip to England.

A CONCRETE BLOCK CHURCH IN KANSAS CITY, MO.

While there he arranged for the manufacture of the Callender's material in this country.

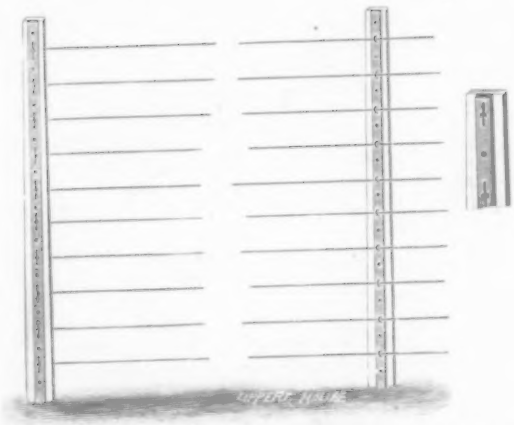
The necessary capital to carry on the enterprise was arranged for in England, but the Engineer Manager to take charge of the new business has not yet been appointed, as it has been decided that such manager must be an American civil engineer of recognized standing in the profession.

The damp course and sheeting manufactured by Callender & Company are of pure refined natural bitumen from the Trinidad Pitch Lake and they have been in successful use in England and the United States for years. A pamphlet of nearly 100 pages giving many illustrations of the buildings in which these materials have been used is an excellent exhibition of all classes of English architecture from small dwelling houses to great public buildings and factories. It is certainly gratifying that the company's American trade justifies a factory in this country.

The Plattenberger Artificial Stone Post.

Mr. J. P. Plattenberger of Savanna, Ill., has invented a system of making fence posts which has some pronounced advantages. The post is made of concrete reinforced with two metal rods running the entire length of the post and bent over at each end near the top and bottom of the post. When the post is to be used for a wire fence one side of it is corrugated to receive the wires, which are fastened to the post by long wire staples inserted in holes which extend entirely through the post and are so made when the post is constructed. Corrosion of the staples under this plan does not destroy the value of the post, for the staples, not being imbedded in the post, the failure of one only requires the insertion of another. The accompanying illustration shows a completed wire fence and the method of attaching the wires, the two posts showing the reverse sides of the fence, that on the right showing the staple encircling the wire and that on the left the ends of the staple spread apart on the back of the post.

When a board fence or one part board and part wire is desired a piece of wood, preferably 2 by 4 inches in section, is bolted to the post by bolts passing through the holes referred to. The fence



WIRE FENCE WITH PLATTENBERGER'S CEMENT POST.

boards are nailed to this strip and the staples for the wire portion can be driven in to it or run through holes in the post as above described. Iron washers are placed between the wood and the post, leaving an air space which is very advantageous to the wood. It is readily seen that the renewal of the wood strip is simple and inexpensive and that the bolts can also be renewed if necessary.

These opportunities to replace the parts which are subject to decay or corrosion without reference to the post itself are great advantages for Mr. Plattenberger's system. It is conceded that the reinforced concrete post itself is practically indestructible, and the ease of replacing the fastenings which this invention has developed removes a common objection which has been made to both natural and artificial stone posts.

Special forms of the posts are made for

end and straining posts of wire fences, picket fences, hitching posts and racks, etc. Mr. J. P. Plattenberger, Savanna, Ill., is the patentee and he will dispose of state, county and farm rights to use the posts.

The "Perfect" Sewer Trap.

The mechanical trap for sewers has many advantages in straight line of flow of sewage, freedom from sediment and prevention of back water and one which reduces the disadvantages to a minimum is much to be desired. The "Perfect" sewer trap has been on the market for eleven years and has been fully tested. It can be used alone or, in case an obstruction in the valve would permit sewer gas to enter where it would be objectionable, it can be used in connection with an ordinary U or P-trap. The mechanical part of the trap valve and valve seat is manufactured from a composition metal which does not corrode and to which grease does not adhere. The trap is so constructed that the valve and valve seat can be readily removed from the casing, through an opening closed by a screw cap, without disconnecting the trap from the pipes, facilitating a ready removal of any obstruction in the pipes connecting with the sewer. The valve closes positively against back water, thus relieving the drain pipes from pressure and overflow in case they are below the level of high water in the sewer or the body of water into which it discharges. The trap is made by the Perfect Sewer Trap Manufacturing Company, 61 Beekman-st., New York, and they will arrange for a practical test of the apparatus by any person interested in its use.

A New Street Sweeper.

A foreman in the street cleaning department of Worcester, Mass., has invented a street sweeper which is reported in the Worcester papers to be very successful. It consists of brushes sweeping the street dirt into a pan which in turn is cleaned by brushes which push the dirt into a conveyor which carries and elevates it to a receiving wagon. One man must go ahead of the sweeper when operating next the curb to sweep the dirt from the gutter a few inches into the street, and one man and team operate the sweeper. The sweeper can be hitched behind a wagon or cart, and when the cart is full it can be detached, the cart driven away to the dump and the sweeper attached to another cart.

Concrete Curbing and Sewer Caps.

The visitor to the Louisiana Purchase Exposition at St. Louis who goes to the Fair grounds on the Olive-st. car line will notice workmen putting down Bedell's new patent concrete lock joint curbing on Olive and McPherson-sts. His patent concrete sewer caps may be seen on De Giverville-ave., the street on the north side of the Fair grounds. A prize medal has been awarded to the St. Louis Granitoid Curb Stone Company for their exhibit of these constructions.

Trade Publications.

The Trussed Concrete Steel Company, Detroit, Mich., issue "Facts Concerning the Kahn Trussed Bar."

The Miles Concrete Building Block Machine Company of Jackson, Mich., issue some circulars descriptive of their machine and its operation which are particularly clear and give an excellent idea of the method of operation. Ralph and Wiest of Indianapolis are the agents for Indiana.

B. F. Sturtevant Company, Boston, Mass., issue the second edition of their catalogue, No. 115, of blowers, engines, motors, generating sets, forges, steam heating apparatus and other products. Their Bulletin, No. 54, contains a handsomely illustrated detailed description of their new foundry and pattern departments, which is of special interest as a report of the latest and best practice in this branch of manufacturing. Their Catalogue, No. 120, describes the various forms of their standard and pony economizers for heating boiler feed water or water for other purposes by means of hot flue gases. It gives full instructions as to operation and repair, choice of type and use with or without mechanical draft. The general office and works of the company are at Hyde Park, Mass.

The Power and Speed Controller Company, 147 Milk-st., Boston, Mass., send a pamphlet containing a detailed description of their controller and a statement of the machinery and operations to which it is applicable.

The International Sewage Disposal Company, Boston, Mass., issue a circular stating the claims for their apparatus and another describing in a general way its plan and method of operation.

Bulletin, No. 9, of the DeLaval Steam Turbine Company gives Denton and Kent's tests of DeLaval centrifugal pumps.

The Clinton Wire Cloth Company, Clinton, Mass., issue a well illustrated description of their fire-proofing system showing the construction of floors in various ways, ceilings, roofs, protection of columns, partitions, etc., footings, sewers, conduits, pipes and ducts and containing report of fire tests. Other catalogues show their wire cloth, fencing, netting, perforated metal, poultry netting, window screens and wire mats.

The Spaulding Print Paper Company, 44 Federal-st., Boston, Mass., issues a new catalogue of the Federal blue printing machines.

The Ambursen Hydraulic Construction Company of Watertown, N. Y., and 176 Federal-st., Boston, Mass., issue a fully illustrated description of and discussion of the principles on which the design is based of their concrete-steel gravity dams. A description of the construction of one is promised for an early issue of Municipal Engineering.

The J. L. Mott Iron Works, New York, issues a special catalogue of fixtures suitable for public comfort stations and public baths.

The Associated Expanded Metal Companies issue a handsome and very valuable scientific discussion of the principles upon which reinforced concrete construction is based, with full information as to methods of making designs, tests of strength and fire-resisting qualities, and preservation of steel by concrete, and suggestions as to methods of construction of floors, roofs, partitions, outside walls, solid and hollow, fireproofing of columns, ornamental plastering, etc., and an excellent pictorial review of modern American architecture in a report of work actually accomplished. Fences, sewers, conduits, tunnels, filter beds, sewage tanks, coal pockets, bridges, docks, shaft linings, light houses, stairways, columns, piers, foundations and many specialities are also beautifully illustrated.

Trade Notes.

ASPHALT.

According to press reports, Federal Judge Bryant is being urged to approve the sale of the Central Asphalt and Refining plant at Port Neches to Mr. Carnes of Memphis, so that the reorganization of the company may follow as quickly as possible. The purchasers desire that the reorganization be effected so that the large plant may be put into operation.

The Columbia Oil, Asphalt and Refining Co., of San Francisco, Cal., has leased the old plant of the Alcatraz Company at Carpinteria, which is now owned by W. H. Crocker, of San Francisco, for a term of five years. The Columbia Oil, Asphalt and Refining Co. will pay an annual rental of $1,200 for the first three years and $1,800 for the next two years, and will also pay a royalty of 30 cents per ton on all asphaltum taken out.

The German-Canadian Asphalt Co., New York City, has been incorporated by G. F. Stiebling, C. E. Eisner of New York City, and Hans Harder of Charlottenburg, Germany.

The Shelby Asphaltum Co., Shelby, Ind., has been incorporated by William Kendall, Thomas C. Bond and Ira Barr.

The special committee of the city council of Salt Lake City, Utah, has recommended the purchase by the city of two asphalt beds at Thistle, from W. G. Nebeker, for $6,000. R. M. Pope has also offered to sell the city 3,200 acres of asphalt land in the Book Cliff Mountains.

An asphalt plant for repairing asphalt pavements is needed at Atlanta, Ga.

BRICK.

The Raritan Brick Co. has been organized and incorporated by citizens of Perth Amboy and Matawan, N. J., as follows: Thoge R. Eskesen, Theodore S. Brown, Karl Mathiasen, F. L. Brown, Bennet K. Eskesen and E. V. Eskesen. A plant will be erected at once near Matawan and offices will be established in both Perth Amboy and Matawan. The manufacture of red building brick will be taken up first, and other lines will follow. Thoge R. Eskesen is president, Karl Mathiasen, vice-president, Theodore S. Brown, secretary and treasurer.

The Baltimore Vitrified Clay Co., Baltimore, Md., is completing its plant at Westport and expects to begin the manufacture of brick about Nov. 1. The new officers of the company are: President, C. C. Bartgis; general counsel, J. Kemp Bartlett; treasurer, Dr. M. H. Carter; secretary, Roy Carter; superintendent, —— Highhouse.

A stock company is being organized in Minneapolis, Minn., by W. W. Whitney of Michigan for the manufacture of a new process of sand-lime building brick.

Samples of clay from Austin, Minn., have been tested and pronounced excellent for building and paving brick.

The Ferris Paving Brick Co., Mechanicsville, N. Y., is installing new machinery for the manufacture of chimney blocks.

The Western Brick Co., 12 S. Second-st., Keokuk, Ia., advises us that it has opened a branch house in the Whitney building, Detroit, Mich., and appointed Teague & Vaughn agents for Michigan, Ohio, Indiana and Canada.

A company is being formed at Des Moines, Ia., to engage in the manufacture of clay products, including paving and building brick and concrete hollow blocks.

The Standard Vitrified Brick Co., recently organized in Coffeyville, Kan., to

manufacture paving, building and sidewalk brick, has purchased the old Stark brick plant together with twenty-one acres of the best shale land in that vicinity. The parties interested in the company are J. A. Johnson, C. E. Woodbury, Huston Weyeth, L. C. Hamilton and D. E. Marshall of St. Joseph, Mo., and W. H. Shepard, J. T. Wettack, Daniel Wells, Daniel Cahill, O. Kentner, G. H. Park and Thompson Black of Coffeyville.

The National Brick Manufacturing and Construction Company., Omaha, Neb., has been incorporated to manufacture brick plants, sell territory and do a general mining business. The incorporators are E. H. Pumphrey, John Ellingsworth and A. J. Hinnick.

CEMENT.

The Vancouver-Portland Cement Company is constructing a large cement plant near Victoria.

The property of the Bridger Improvement Company, Bridger, Mont., has been purchased by Samuel H. Glidden on behalf of Minneapolis and Chicago parties, who will develop the gypsum deposits, installing a mill of 100 tons daily capacity.

The Manitoba Gypsum Company, Winnipeg, Man., will enlarge its mill at Gypsumville to 20,000 tons annual capacity.

The Louisiana Lime Company, Hennen Building, New Orleans, La., advises us that it is a possible purchaser of cement machinery. It desires to build a plant.

The Kansas Portland Cement Company of Iola, Kan., has doubled its capacity in order to meet the demands made upon it.

Robert Wetherill & Co. are building several large kilns for the Bath Portland Cement Company at Chester, Pa.

The Empire Portland Cement Company, Warner, N. Y., has resumed operations with a full force of men. Charles A. Lockard, Syracuse, manager.

A company of local capitalists of Austin, Tex., are organizing and will develop the extensive deposits near that city on a large scale.

Dr. R. F. Le Mond of Denver, Colo., who owns valuable cement lands east of Quanah, Tex., contemplates building a cement mill.

The E. J. Winslow Company, Chicago, has been incorporated to manufacture cement by B. B. Berker, C. L. Condee and C. A. Pearson.

The Alliance Cement Company, Alliance, Pa., has been incorporated by W. F. Hallstead, G. Bogart, J. H. Fellows and F. N. Moore.

Q. A. Jones is at the head of a new enterprise that will erect a new cement mill at Connellsville, Pa.

The Hecla Portland Cement Company, Bay City, Mich., was formally declared solvent by Judge Swan at Detroit Oct. 17, and the petition for bankruptcy dismissed. The litigation in the company's affairs has extended over a year, but all of the testimony taken at different times satisfied the attorneys in the case that the company was sound financially, and has been, according to the testimony of Julius Stroh, president of the company, ever since its organization.

The Chickamauga Cement Company, whose plant is located near Rossville, Ga., is completing the installation of a hydrating plant, and will now manufacture hydrated lime in addition to cement products. Prest. Cummings.

The Eagle Portland Cement Company, Eagle, Waukesha County, Wis., recently incorporated, will erect a $500,000 cement mill at Eagle.

CONCRETE BLOCKS.

Formal application for a patent on an improved cement block machine has been made by N. W. Warren of Austin, Minn.

The Smith Cement Brick Company, Tacoma, Wash., has been incorporated by Horace G. Smith, John E. Smith and Fred R. Smith.

A. C. Fuge, West Bend, Wis., contemplates the manufacture of cement blocks.

O. E. Ruble, Willmar, Minn., has purchased machinery for the manufacture of hollow building blocks.

Ed E. Smith, Barron, Wis. is manufacturing cement building blocks.

G. R. Kaun and L. Geddel', Lake Crystal, Minn., have engaged in the concrete sidewalk business.

W. D Rowe, Crookston, Minn., has purchased a cement block machine.

Concrete building blocks are being manufactured from the tailings from the concentrators at Wallace, Idaho.

A Miracle concrete block machine has been purchased by Contractor Rasmussen at Edgeley, N. D.

Cement building blocks are being manufactured at Centerville, Ia., by a Mr. Bell of Waterloo, Ia.

The J. H. Keith Company is installing a plant for making cement building blocks at Newton, Ia., is planning one for Carroll, Ia., and will locate a central plant in Des Moines.

The Commercial Club of Crookston, Minn., is interested in securing a concrete block plant for that city.

The business of the Mankato Sidewalk Company, Mankato, Minn., has been purchased by A. Thompson, who will continue it under the old name.

Faus & Seiler, Montevideo, Minn., have purchased the rights to manufacture Miracle building blocks, and will soon have a plant in operation.

J. J. Becker, Paul Labudde and Scott Bowen, Garner, Ia., have formed a partnership and purchased machinery for the manufacture of cement building block, stone, brick and tile.

The Thief River Falls Cement Stone Company, Thief River Falls, Minn., will manufacture sand and cement bricks.

W. H. Kinsley retired from the copartnership of the Michigan Iron Works Company at Manistee, Mich., Oct. 4, and William Ward, jr., became a member of the company, which will continue business as formerly.

The Granolithic Stone & Cement Company, Leavenworth, Kas., composed of C. J. Roth and A. S. Reiff, have begun the manufacture of artificial stone and cement brick at their plant at 324 Cherokee street.

The Auburn Concrete Machinery Company, Auburn, Ind., has been incorporated by Mentor Wetzstein, Frank Borst and Sherman Kelley.

Ward & Rice, Fargo, N. D., have purchased a Miracle machine and the exclusive right to make the Miracle concrete block in Fargo and Moorhead, and will soon begin the manufacture of concrete blocks.

A stock company has been formed and a machine purchased, at Milford, Mich., for the manufacture of cement building blocks.

The U. S. Cement Shingle Machinery Company has been established at Saginaw, Mich., for the purpose of supplying machinery and the process for making cement shingles under the patent of George C. Zwerk, the original inventor and patentee.

The Wymore Concrete Company, Beatrice, Neb., has been incorporated to manufacture concrete blocks for buildings and sidewalks, and handle stone and cement. The incorporators are E. N. Kauffman, George T. Stephenson, J. R. Jackson, S. S. Speier and A. D. McCandless.

The American Concrete Stone Company, Schenectady, N. Y., has been incorporated to manufacture and sell cement and lime by E. E. Stanton, A. G. Lindley and E. D. Mereness.

H. E. Sinnock, Massillon, O., will erect a plant at once for the manufacture of hollow building block or stone. A mixing and moulding machine has been purchased.

The Hot Springs Concrete Company, Hot Springs, Ark., has been incorporated with officers as follows: President, W. S. Sorrells; secretary, J. S. Horner; treasurer, F. M. Williams.

The Randel & Small Cement Construction Company, Richmond Hill, Long Island, N. Y., recently incorporated, has elected officers as follows: President, Herbert Small, Richmond Hill; Secretary and Treasurer, John Randel, Brooklyn; Directors, John Randel, Herbert Small and William A. De Frost.

The Indiana Cement Block and Post Company, Indianapolis, has been incorporated by Clarkson H. Moon, James A. Mitchell, Charles L. Whitesell, James G. Anderson and William E. James.

The Concrete Machinery Company, Detroit, Mich., was incorporated Oct. 9.

Charles A. Nutter, Wausau, Wis., contemplates erecting a plant for the manufacture of all kinds and colors of cement and concrete art stone building material.

A company is being organized at Syracuse, N. Y., by Edwin C. Ide, C. E. Colton and Charles E. Ames for the manufacture of cement building blocks.

The H. E. Rogers Construction Company, New London, Conn, has a contract to erect a machine shop, 230x165 feet, of artificial stone for the Brown Cotton Gin Company of New London. The stone is hardened by the Rogers process and can be laid in the wall 24 hours after manufactured.

The Michigan Iron Works, manufacturers of cement working machinery at Manistee, Mich., advises us that they are now placing some new machinery so they can take care of their increasing trade. This has been a good season with the company and they are working overtime to catch up with the orders that they are behind with. September was the company's banner month of the season.

The Inman-Colvin Manufacturing Co., Toledo, O., has been incorporated to make concrete blocks for all kinds of building and construction purposes. The company's plant will be located on Swan Creek, in the rear of the Burnett House. I. H. Inman, S. S. Colvin, E. Hernley and Fred W. Seibert are the incorporators.

A plant has been established at Wahoo, Neb., for the manufacture of artificial stone.

The Contracting-Engineering Co., 1005 A-st., Tacoma, Wash., has been organized by Charles B. Hurley and George C. Mason, specialists in reinforced concrete, concrete blocks, etc.

The Kansas Concrete Stone Co., Enterprise, Kan., has been incorporated.

Coutts & Ross, proprietors of the Grinnell Stone Manufacturing Company, Ginnell, Ia., are manufacturing cement building blocks, according to press reports.

The organization of a company to manufacture concrete cement is proposed at Reading, Pa. David F. Sanders of Pottsville is interested.

A company has been formed at Elizabethtown, Pa., under the management of Joseph K. Landis, to manufacture hollow concrete blocks.

The Keystone Cement Block Company, which will locate at Norristown, Pa., was organized Oct. 13, with David H. Ross of Conshohocken as president and D. P. Sanders of Pottsville as general manager. A large plant will be erected.

The Concrete Building Block Company, Jersey City, N. J., has been incorporated by J. Roosevelt Shenley, William G. Shenley, Frank M. Hastings, jr., and George M. Richards.

A cement block plant is contemplated by George Holt of Spicer, Mich.

W. G. Engle, C. E. Engle and C. M. Engle of Enderlin, N. D., contemplate the manufacture of cement blocks in the spring under the Miracle patents.

A partnership has been formed at Oshkosh, Wis., by F. C. Horn of Oshkosh and Michael McCongo of Fond Du Lac, for cement sidewalk work and roofing buildings.

The Economy Cement Building Block Company has been organized at Winterset, Ia., by A. B. Shriver, Charles Anthes and Judge Wilkinson, who will en-

gage in the manufacture of cement blocks.

Wade & Son, Mishawaka, Ind., have leased the old iron works foundry on Bridge-st. and will manufacture cement blocks, cement fence posts and hitching posts by a new process this winter.

PURCHASE OF MACHINERY.

The Louisiana Lime Company, Hennen Building, New Orleans, La., advises us that they are possible purchasers of cement machinery, as they desire to build a plant.

C. F. Davis, Bucyrus, O., is a possible purchaser of machinery for general construction work.

Lucas L. Lewis, Marion, Kas., advises us that he is a possible purchaser of cement machinery and sidewalk tools.

J. H. Zeigler, 613 E. Sherman-st., Hutchison, Kas., advises us that he is a possible purchaser of a machine for making building blocks and sidewalk tools.

C. A. Prout, Wheaton, Ill., desires to purchase surveyor's instruments.

PURCHASE OF MATERIALS.

We are advised by Lucas L. Lewis, Marion, Kas., that he desires to purchase cement building blocks.

C. F. Davis, Bucyrus, O., advises us that he desires to purchases crushed stone and cement.

C. A. Prout, Wheaton, Ill., advises us that he is a possible purchaser of paving materials.

LIGHTING AND POWER.

The Mitchell Engineering and Machinery Company, Butte, Mont., has been incorporated to engage in a general mechanical engineering business, operating power plants, etc. The directors are Frank S. Mitchell, A. J. Mitchell and Robert A. Holley of Butte.

The Baltimore Electric Power Company, Baltimore, Md., has been incorporated to construct the power and light plant of the Maryland Telephone Company. The incorporators are John T. Stone, David E. Evans, Henry W. Webb, Robert F. Bonsal and William P. Spring.

The Michigan Gas Machine Company, Berrien Springs, Mich., has been incorporated to manufacture, sell and install gas machines. The stockholders are Maurice Montgomery of Chicago, Oscar J. Pennell, Berrien Springs; Albert E. Wilson, Elkhart; Hugh L. Stryker, Maude F. Allen and George A. Roose, Berrien Springs.

The Jackson Center Gas Company, Lima, O., has been incorporated by C. P. Callahan, Charles Laughey, P. J. Coolahan, Rodney Lynch and Lester Huffman.

The Standard Gas Igniter Company, Buffalo, N. Y., has been incorporated to make devices for use in burning gas, by John F. J. Boeckel and G. A. Barkowsky, Gowanda, and Arthur Reynolds of Forestville.

The Chicago Stage Lighting Company, Chicago, Ill., has been incorporated to manufacture electrical apparatus by J. J. Fanning, G. E. Stevenson and W. J. Stevenson.

The Electrical Securities Corporation has been incorporated to manufacture and deal in electrical, gas, water and steam power machinery. The principal offices will be Schenectady. The directors are nearly all officers of the General Electric Company.

The Westchester County Lighting Company and the New York and Westchester Lighting Company of New York City have merged their interests.

The Allis-Chalmers Company, Milwaukee, Wis., offer for sale the 5,000-horse power engine and Bullock generator which are supplying the current for the decorative lighting at the St. Louis Exposition.

The following electric and gas lighting companies have been incorporated: Empire Gas Improvement Company, New York City. C. M. Le Furge and F. W. Decker of Brooklyn and F. G. Wetterau of New York City.

Syracuse Electric Company, Syracuse, N. Y. William H. Horton, S. J. Kelley and M. J. Myers.

Excelsior Gas Company, Excelsior, Minn.

Compton Electric Company, Compton, Ill. J. S. Richardson, L. W. Kutter and W. H. Hillis.

Buffalo Lighting Company, Buffalo, N. Y. Herman McMillan, John E. Wesley and Luella McMillan.

Oklahoma City Oil and Gas Company, Oklahoma City, Ok. T. C. G. Jones and C. F. Colcord of Oklahoma City and Robert Galbraith of Red Fork.

MISCELLANEOUS.

Bids will be received Nov. 21 at New Orleans, La., for the sale of a franchise to construct, maintain and operate for a term of fifty years, a street railway in the Fifth District, for carrying passengers. V. Tujague, comptroller; T. W. Campbell, clk. council.

The Frederick Lime and Stone Company, New York City, has been incorporated by John O'Donnell, W. J. Vetter and D. R. McDonald of Brooklyn.

The Republic Creosoting Company at Minneapolis, Minn., is manufacturing creosoted wooden blocks for Chicago and Toledo, in addition to those intended for use in Minneapolis.

The Quincy Quarries Company, Jersey City, N. J., has been incorporated by Louis B. Dailey, John M. Ruston and Frank H. Waggoner.

The South Bend Sand, Gravel and Cement Company, South Bend, Ind., has been incorporated by J. A. Judie, J. B. Varia and D. C. Gibson.

The Putnam Mills and Power Company has been incorporated by James B. Floyd, Thomas B. Floyd, O. B. Nisbet and others, and will establish a plant at Eatonton, Ga., for developing water power for manufacturing purposes.

The Orleans Sand and Gravel Com-

pany, Washington, D. C., has been incorporated by G. H. Corey, Eugene Schooley and J. L. Cohencious.

The Beechwood Park Land Company, Summit, N. J., has been incorporated by Dr. William H. Lawrence, John H. Nelson and Atwood L. De Coster. The company's office is at 457 Springfield-ave., Summit.

P. H. Sanneman, Clay Center, Kas., advises us that he is a possible purchaser of carpenter and planing mill machinery and building materials.

The Board of Trustees of the Sanitary District of Chicago has awarded the contract for the turbine water wheel equipment for the new power house of the Chicago drainage canal to the Wellman-Seaver-Morgan Company. The power station is located near Joliet and will contain four 6,000-horse-power turbine wheels direct connected to electric generators and two 600-horse-power exciter units. This is the largest single water power installation in the West, except that of the Lake Superior Power Company, which will, when completed, consist of 50,000 horse-power.

P. J. Healey & Company, 10 Tremont-st., Boston, report much activity and have recently closed some large contracts for cleaning sewers with the Healey patent sewer cleaner. Bayonne, N. J., is the latest place to adopt this system, having placed four of the cleaners in operation in sewers that have withstood all previous attempts. Mr. S. A. Frazier is now representing the company and through him many localities are using and leasing this valuable device.

The C. O. Bartlett and Snow Company of Cleveland, O., report the following recent sales: Buckeye Reduction Company, Findlay, O., S. Mendelson, Elyria, O., Binns Stucco Retarder Company, Uhrichsville, O., Triumph steam dryers; D. H. Grandin, Jamestown, N. Y., electric conveyor and other machinery; Crown Dryer Company, Cleveland, O., Ohio Sand Company, Conneaut, O., elevating and conveying machinery; I. E. Boomer, Detroit, Mich., Triumph gravel excavator and digger; Lowe Bros., Dayton, O., four special paint machines with motor drives; Mogollon Gold and Copper Company, Cooney, N. M., special grading machinery; James W. Ellsworth & Co., Cleveland, O., coal elevating and conveying machinery.

Patents Concerning Cement and Its Uses.

The following is the second installment of a list of patents on the manufacture and use of cement and machinery for the same issued since June, 1903.

738,830. Sept. 15, 1903. Blockmold. Perry B. Miles, Jackson, Mich.

738,910. Machine for Making Products of Cement or Artificial Stone. William E. Jaques, Grand Rapids, Mich.

738,940. Railroad Tie. Alfred A. Raymond, Chicago, Ill.

738,960. Fireproof Floor and Ceiling Construction. John T. Simpson and Marshall N. Shoemaker, Newark, N. J.

739,549. Sept. 22, 1903. Mold or Form for Concrete Walls. W. A. Kirk, Madison, Ind.

739,854. Sept. 29, 1903. Combined Curb and Gutter. Guy M. Gest, Cincinnati, O.

740,024. Cement-Brick Mold. Solomon M. Kimble, Corunna, Mich.

740,039. Concrete-Arch Construction Walter C. Parmley, Cleveland, O.

740,188. Manufacture of Artificial Building Material. Adolphe Seigle, Lyons, France.

740,590. Oct. 6, 1903. Method of Dam Construction. Mark S. Rochford, Los Angeles, Cal.

740,879. Ball Grinding Mill. Paul T. Lindhard, New York.

741,040. Oct. 13, 1903. Concrete or Cement Building Block. John H. Jones, Fostoria, O.

741,054. Fireproof Floor Construction. Ernest Merrick. Elizabeth, N. J.

741,137. Artificial Stone Tub. Frank Jager, West Hoboken, N. J.

741,289. Flooring and Method of Constructing Floors. Frank L. Union, Chicago, Ill.

741,354. Fence Post. John F. Martin. Marshall, Mich.

741,451. Building Block Molding Machine. Perry L. Britain, Busch, Okla.

741,469. Artificial Stone Post. Earl H. Dresser, Litchfield, Mich.

741,516. Cement Brick Machine. John D. Luttrell and William C. Cantrell. Benton Harbor, Mich.

741,579. Composite Fence Post. R. D Hayward, Warsaw, Ind.

741,934. Oct. 20, 1903. Fireproof Construction. C. H. Scammell, New York.

742,019. Device for Making Artificial Stone Blocks. Howard G. Goodwin, Akron, O.

742,094. Building Block and Wall. Frank E. Kidder, Denver, Col.

742,144. Oct. 27, 1903. Cross Tie for Railroads. D. S. Affleck, Chesterton, Ind.

742,166. Mold for Concrete Posts. Henry H. Clough, Elyria, O.

742,192. Machine for Making Artificial Stone Building Blocks. Oliver A. Hoyt, Akron, O.

742,574. Machine for Making Sand or Chemical Brick. C. W. Boyle, Grand Rapids, Mich

742,591. Cement Mixer. William Clark, Caledonia, N. Y.

742,924. Nov. 3, 1904. Manufacture of Artificial Stone. C. W. Stevens, Harvey, Ill.

742,982. Crushing and Pulverizing Mill. E. C. Griffin, Newton, Mass.

743,218. Manufacture of Portland Cement. H. K. G. Bamber. Greenhithe, Eng

743,391. Building Blocks and Wall. F. E. Kidder. Denver, Col

743,525. Nov. 10, 1903. Method of Molding Stone. Albert Lake, Washington, D. C.

743,538. Rotary Kiln. W. Michaelis, jr., Chicago, Ill.

744,471, 744,472. Nov. 17, 1903. Process of

Making Bricks or Blocks, Artificial Stone, etc. E. R. Sutcliffe, Leigh, Eng.

744,509. Apparatus for Forming Cement Water Tanks. J. T. Donahoo, Edgar, Neb.

744,878. Nov. 24, 1903. Pavement. C. H. Sayre, Camden, N. J.

744,976. Cement Post. Henry McMaster, Detroit, Mich.

745,068. Building Construction. Alex Menczarski, New York.

745,291. Apparatus for Manufacturing Cement Pipes or the Like. Bruno Noldner, Breslau, Germany.

745 585. Dec. 1 1903. Concrete Mold. Alonzo Ferguson, Indianapolis, Ind.

746,051. Dec. 8, 1903. Mold Box for Conduit Joints. E. L. Dubois, New Orleans, La.

746,445. Core for Use in Wall Molds. A. T. Boise, Boyne, Mich.

746,476. Mold for Making Artificial Stone. F. L. Dykema, Grand Rapids, Mich.

746 947. Dec. 15, 1903. Concrete Mixer. W. A. Fritz, Zanesville, O.

747,156. Fence Post. L. H. Evans and B. F. Erb. Des Moines, Ia.

743,193, 747,228, 747,229. Indurating Stone. L. T. Leet and C. A. O. Rosell, New York.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

CONTEMPLATED WORK.

Lorain, O.—Paving is contemplated for W. Erie-ave.

Little Falls, Minn—Paving is proposed for Broadway-st.

La Crosse, Wis—Limestone macadam is desired for State-st., from Sixth to Twelfth.

Racine, Wis—A resolution has been passed for paving Douglas-ave. Mayor Nelson.

Tama, Ia.—Cement sidewalks are contemplated on a number of streets next spring.

Springfield, Ill.—An ordinance has been passed for paving Fourth-st. with asphalt.

South Bend, Wash.—The City council decided Oct. 17 to build several new sidewalks.

New Philadelphia, Pa.—Bids will be asked for constructing sidewalks on several streets.

Des Moines, Ia.—Asphalt paving is contemplated for eight blocks of Newcomb and Ingersoll-aves.

Toronto, O.—The County Commissioners have decided to issue $125,000 bonds for improving county roads.

Sarnia, Ont.—The rate payers have petitioned for brick paving on George-st., from Front to Christina.

Hutchinson, Kan.—The Cy. Coun. has ordered 8 blocks of Sherman-st., between Main and Bismarck, paved.

Mansfield, O.—An ordinance has been passed providing for the paving of S. Maple-st., from Sixth to Eighth.

Jacksonville, Fla.—Provision is made in the budget for paving 21 streets with gravel, brick and concrete.

Bunkie, La.—The town council has authorized the construction of brick sidewalks on East and West Main-st.

Roscie, Pa.—Preliminary steps towards issuing $30,000 bonds for grading, paving and sewers, have been taken.

Oswego, N. Y.—Brick paving is contemplated for Water-st., between Bridge and Cayuga-sts. Cy. Engr. Snyder.

Findlay, O.—An ordinance has been passed providing for the issue of $14,000 bonds for paving Washington-st.

Hattiesburg, Miss.—The citizens are agitating the matter of paving the principal streets with vitrified brick.

Lawrence, N. Y.—This town voted, Oct. 12, to issue $10,000 bonds for grading and paving the roads and highways.

West Hoboken, N. J.—Bids will be asked soon for paving Summit-ave., from Malone to Angelique-sts., with Belgian blocks.

Muskegon Heights, Mich.—The question of issuing $2,500 bonds for improving Peck-st. with gravel will be voted on Nov. 8.

Parkersburg, W. Va.—About twelve blocks of brick paving has been decided upon by the Board of Affairs. J. V. Dunbar, city engineer.

Lawrence, Mass.—The committee on sidewalks voted to construct 3,793 feet of edgestone and concrete sidewalks. Paul Hannagan, superintendent.

Findlay, O.—An ordinance was passed Oct. 17 for paving Franklin-ave., from Defiance-ave. to Howard-st., with vitrified block.

Brooklyn, N. Y.—The Board of Estimate has allowed $300,000 for grading and paving Atlantic-ave., which will be made into a boulevard.

Alton, Ill.—Ordinances have been introduced in Council providing for the paving of State, Langdon, Alby, Fourth, William and Apple-sts.

Washington, D. C.—The District Commissioners have decided to expend $1,100 for paving Florida-ave., between Fourth and Fifth-sts., N. E., with asphalt.

Berkeley, Cal.—A resolution of intention has been adopted for constructing concrete gutters and macadamizing Hazel-st. C. S. Merrill, town clerk.

San Mateo, Cal.—Resolutions of intentions have been adopted for macadamizing Baldwin-ave. and constructing concrete curbs. P. F. Maloney, street superintendent.

St. Paul, Minn.—A preliminary order was passed Oct. 18 for macadamizing, leveling and filling University-ave., from Dale-st. west to the city limits.

Topeka, Kas.—The Board of County Commissioners has decided to extend the macadam paving on Sixth-ave. south to the Catholic cemetery, a distance of about three city blocks.

Raleigh, N. C.—Repaving is proposed for Fayetteville-st. and it has been suggested that the Belgian block pavement be taken up and brick paving constructed.

Oneida, N. Y.—The property owners on Broad-st. have petitioned for brick or asphalt paving. The question of paving Williams and Sconondoa-sts. is also being agitated.

Chicago Heights, Ill.—An ordinance has been passed for constructing a six-foot cement and concrete sidewalk on Main-st., from Chicago-road to Euclid-ave. J. C. Mote, mayor; P. F. Jirtle, city clerk.

Joliet, Ill.—Bids will be received in February or March for asphalt and stone paving as follows: Richard-st., 2,000 feet; Desplaines-st., 1,000 feet; Sherman-st., 1,100 feet. H. A. Stevens, city engineer.

Davenport, Ia.—Resolutions have been introduced providing for the paving of the alley between Fourteenth and Fifteenth and Fernan-st. and Grand-ave.; also for asphalt paving on Main-st., between Locust and Lombard. City Engineer Murray.

Biloxi, Miss.—The Commercial Club is discussing plans for constructing a boulevard between this city and Henderson Point, along the beach, and will request the commercial bodies in other coast towns to assist in the movement.

Birmingham, Ala.—A resolution was passed Oct. 19 providing for paving Highland-ave., from Twentieth-st. to the west line of certain property with creosoted wood blocks, and from that point to the city limits with bituminous. J. C. Murray, city clerk.

Pekin, Ill.—The board of local improvements has rejected the bids submitted Oct. 17 for paving five blocks of streets, and decided to postpone the paving of several streets until spring. The bids were higher than the estimate made by the city engineer.

Vailsburgh, N. J.—Special.—Eugene A. MacMurray, ch. engr., says that the borough has under consideration street improvements which will cost approximately $75,000. All work is done after plans prepared by and under the supervision of Mr. MacMurray.

Baltimore, Md.—An ordinance has passed third reading providing for paving and appropriations, as follows: Asphalt block paving, Eastern-ave., $55,000; asphalt block paving, streets around Harlem Square, $25,000; asphalt block paving, Charles-st., $57,000; Belgian block paving, Orleans-st., and asphalt paving, Glover-st., $48,000.

Albany, N. Y.—The city engineer has been directed to change the specifications for asphalt block paving so that bids may be received for laying the blocks on the edges and flat side. The original specifications provides for laying the blocks on their edge between the street railway tracks and two feet on each side, and the remainder on the flat side.

CONTRACTS TO BE LET.

Bakersfield, Cal.—Bids are asked until Nov. 12 for completing Kern River road. Bd. supvrs.

Franklin, Ind.—Bids are asked until Nov. 1 for constructing cement sidewalks. Arthur R. Owens, cy. clk.

Madisonville, O.—Bids are asked until Nov. 1 for constructing improved sidewalks on Moore-st. J. A. Conant, vil. clk.

South Bend, Ind.—Bids are asked until Nov. 22 for building cement sidewalks on Lawrence-st. W. A. McInerny, chmn. pub. wks.

Brazil, Ind.—Bids are asked until Nov. 10 for grading and graveling 10,612 ft. of road in Jackson twp. J. Frank Smith, co. audt.

Des Moines, Ia.—Bids are asked until Nov. 7 for vitrified brick paving on concrete base in an alley. W. W. Wise, chmn. B. P. W.

Des Moines, Ia.—Sealed bids are asked until Nov. 7 for curbing Commercial-st. with Portland cement curbing. W. W. Wise, chmn. B. P. W.

Durango, Colo.—Bids are asked until Nov. 10 for constructing a portion of a State wagon road. Bd. of Constr. of La Plata County rd.

Wyandotte, Kas.—Sealed bids are asked until Nov. 7 for constructing ¾ mi. of a macadam paving on Shawnee road. Frank H. Holcomb, co. clk.

Webb City, Mo.—Sealed bids are asked until Nov. 7 for 755 sq. yds. of brick paving on Church-st. and 1,749 sq. yds. of Webb-st. W. E. Smith, cy. engr.

English, Ind.—Bids are asked until Nov. 7 for grading, draining and macadamizing road beds in Whiskey Run twp. and in town of Milltown. S. E. McFall, co. audt.

Tom's River, N. J.—Sealed bids are asked until Nov. 15 for building a gravel road in Lacey twp., 23,753 ft. in length. E. Bennett, dir. bd. chosen freeholders.

Cleveland, O.—Sealed bids are asked until Nov. 3 for paving the roadway of

a bridge over the Big Four tracks at Denison-ave. with brick. W. J. Springborn, prest. B. P. S.

Washington, D. C.—Bids are asked until Nov. 8 for constructing the approaches to the grounds of the U. S. Naval Hospital. Bureau of Supplies and Accounts, U. S. N.

St. Bernard, O.—Bids are asked until Nov. 18 for grading and macadamizing and constructing cement curb and gutters on Jackson-st. from Sullivan to Tower-ave. George Meyer, vil. clk.

Atlanta, Ga.—Bids are asked until Nov. 7 for 4,500 sq. yds. of asphalt paving on Mitchell-st. and 2,250 sq. yds of small granite block paving on Madison-ave. R. M. Clayton, cy. engr.

Hamilton, O.—Sealed bids are asked until Nov. 4 for repairing the surface of High-st., from the High and Main-st. bridge to Millville-ave., with block asphalt. John B. Connaughton, clk. B. P. S.

Marion, Ind.—Sealed bids are asked until 7:30 p. m., Nov. 1, for improving unfinished cement sidewalks on Highland-ave.; constructing cement sidewalks on D-st. from Sixth to Fourteenth-sts. John O. Willson, cy. clk.

Jefferson City, Mo.—Sealed bids are asked until Nov. 7 for curbing, guttering and macadamizing three blocks, aggregating about 2,900 lin. ft. of curb and gutter, and about 1,850 cu. yds. of macadam. J. C. Herring, cy. engr.

CONTRACTS AWARDED.

Muskogee, I. T.—The contract for street paving was awarded, Oct. 8, to Charles Derr of Guthrie.

Columbus, O.—The contract for paving the sidewalks in sundry streets was awarded to the Acme Paving Company.

Ocean Park, Cal.—The contract for paving Windward-ave., in Venice, was award to Calkins & Conaway.

Goshen, Ind.—W. W. Hatch & Sons have been awarded the contract for brick paving in alleys for $3,200.

East Chicago, Ind.—The contract for macadamizing the Osborn and Ropp roads was awarded to Downey & Peterson.

Franklin, Ind.—The contract for constructing cement sidewalks was awarded to N. B. Moore of Lafayette, Ind.

Chicago Junction, O.—The contract for paving the streets was awarded, Oct. 18, to William Vogt & Son of Massillon.

Minonk, Ill.—The contract for constructing five miles of concrete walks was awarded to the Kankakee Artificial Stone Company.

Marion, O.—The contract for constructing a stone sidewalk was awarded to P. Drake & Sons, at 14½ cts. a sq. ft.

Albany, N. Y.—The contract for paving Yates-st., from Lexington-ave. to Robin-st., was awarded to M. F. Dollard, for $9,648.40.

Cedar Rapids, Ia.—The Jackson Construction Company has been awarded the contract for sidewalk order No. 10 at 10¼ cts. a sq. ft.

Louisville, Ky.—L. A. Figg secured contracts for constructing sidewalks on five streets and G. W. Gosnell on three streets Oct. 4.

Ansonia, Conn.—The contract for constructing 2,116 ft. of Macadam road was awarded to Frank Brault at $1.67 a lin. ft.; 2,301 ft., $1.44.

Emporia, Kas.—James Northington was awarded the contract for constructing brick and stone sidewalks and John S. Morgan for building cement sidewalks.

Omaha, Neb.—The Barber Asphalt Paving Company was awarded the contract, Oct. 15, for paving 16th-st., from Douglas to Izard, with asphalt, at $1.49 a sq. yd.

Elwood, Ind.—The contract for four mls. of gravel road construction on the Wardwell Road was awarded to Habit & Co. of Elwood for $10,500.

Cincinnati, O.—The contract for paving the approaches to the proposed Grandin-road viaduct was awarded to Henkel & Sullivan Oct. 20 for $51,816.

Atchison, Kas.—The contract for paving Sixth-st. with brick was awarded to McGuire & Stanton of Leavenworth at $1.17½ a sq. yd. for paving. Total, $18,273.

New York City.—Bids received Sept. 28 for asphalt paving Brooklyn Borough showed a reduction of from $1.80 and $1.90 a sq. yd. to 93 cents and 94 cents a sq. yd.

Noblesville, Ind.—Prichard & Stewart were awarded the contract for constructing the Lafayette gravel road for $5,278.60. The length of the road is 18,700 ft.

Syracuse, N. Y.—Paving contracts were awarded Oct. 17 as follows: Gifford-st., S. Geddes-st. to Wilbur-ave., Thomas Marnell, Syracuse and W. Fayette-sts., G. D. Dickinson.

Savannah, Ga.—The Dixie Stone Co. was awarded the contract Oct. 12 for constructing artificial stone sidewalks on Whitaker-st., from Anderson to Fortieth-st., at 83 cents a sq. yd.

Charleston, S. C.—The contract for furnishing 1,250,000 paving bricks for street paving purposes was awarded to the McAvoy Brick Co. of Philadelphia at $24.50 per 1,000.

Ballard, Wash.—The contract for improving Crawford-st., from Sixth-st. to Eighth-st., was awarded to Manney & Co. for $4,287, and for Second-ave., from Leary-ave. to Broadway, for $1,674.

Ft. Leavenworth, Kas.—The contract for building four miles of concrete paving, and guttering at this fort was awarded to the Davenport Granitoid Co for about $10,000.

Bedford, Ind.—Contracts for road construction have been awarded as follows: Flinn twp., 16,871 ft., Clark & Beavers and Thomas T. Ray; Shawswick twp., 18,047 ft., John R. Henderson.

Topeka, Kas.—The contract for paving Jackson-st., from Twelfth to Huntoon, and Twelfth-st., from Jackson to Kansas-ave., with brick was awarded Oct. 10 to Hanley & Ritchie at $1.19 a sq. yd.

Warren, O.—The contract for macadamizing S. Tod-ave. was awarded to McManus & Condon for $7,700, and for

paving E. Market-st. and Thorn-st. with asphalt block and cement curb, to V. Mango & Co.

Boston, Mass.—The contract for grading, surfacing and other work at Revere Beach reservation, and Lynnway, from Revere-st. to Saugus River, Revere, was awarded to E. W. Everson & Co. for $117,063.

Muskegon, Mich.—The Barber Asphalt Paving Co. was awarded the contract Oct. 19 for paving Sixth-st. and Forest-ave. with bituminous macadam at $1.84 a sq. yd. for paving and 46 cents. a lin ft. for curb and gutter.

Schenectady, N. Y. — Beckwith Bros. have been awarded the contract for laying concrete walks on Avenue A at 58½ cents a sq. ft. The contract for grading Church-st. was awarded to Beckwith Bros. at 18 cents a cu. yd.

Brooklyn, N. Y.—The contract for regulating and repaving with asphalt on a concrete foundation Humboldt, Debevoisee and Moore-sts. was awarded Oct. 12 to the Bermudez Asphalt Co. at 90 cents a sq. yd., or $32,355.

Ft. Snelling, Minn.—The contract for constructing 3,600 sq. ft. of cement sidewalks, 100 sq. yds. of crossing and 100 lin. ft. of curbing at this fort was awarded Oct 11 to Michael J. Lang of St. Paul for $1,480.

Tacoma, Wash.—The contract for constructing cement sidewalks in a district between the alley between E-st and Tacoma-ave. and L-st., and the section bounded by S. Fifteenth and S. Nineteenth-sts., was awarded Oct. 1 to W. J. Murphy for $19,873.

Paducah, Ky.—The contract for paving Broadway-st. from Fifth to Ninth-sts., was awarded Oct. 10 to the Nashville Roofing and Paving Company. Bitulithic paving will be constructed. The contract for building concrete sidewalks was awarded to E. C. Terrell.

Davenport, Ia.—The McCarthy Improvement Company was awarded contracts Oct. 12 for paving streets as follows: Perry-st., exca., 29 cts.; concrete and asphalt paving, $1.97; combined curb and gutter, 68 cts. Oak Lane-st., exca., 49 cts.; concrete and asphalt paving, $2. Bids were received the same day for asphalt block paving as follows: One Hundred and Fifty-fourth-st. from Third-ave. to Elton-ave.; Asphalt Const. Co., $2.18 a sq. yd., or $15,572; Warren-Quinlan Co., $1.97, or $15,519; N. Y. Bermudez Co., $2.05, or $14,502; Hastings Pavement Co., $1.80, or $14,087

Rochester, N. Y.—The contract for paving Hebard-st. with asphalt was awarded Oct. 11 to the Rock Asphalt Paving Co. for $8,186.50. The contract for paving University-ave. from Main-st. to Atlantic-ave. with asphalt and Medina block, was awarded Oct. 14 to Whitmore, Rauber & Vicinus for $50,868.40.

Vailsburg, N. J.—Special.—Bids were received Oct. 7 and contracts awarded for the following: Grading Sunset-ave., Frank W. Snyder of Vailsburg; curbing, Brown & Rusling, Newark; artificial stone sidewalks, W. H. Turrell. The approximate cost of this work is $70,000. Eugene A. MacMurray, cy. engr., 222 Clinton-st., Newark.

Joplin, Mo.—Contracts were awarded Oct. 4 as follows: Macadamizing Ivy-st., from Eighteenth to Twentieth, S. T. Davis; grading and macadamizing Moffet-ave., from Seventeenth to Nineteenth, and from Tenth to Fifteenth, W. F. Jenkins; building sidewalks on Nineteenth-st., from Grand-ave. to Ivy-st., B. C. Hilsabeck; macadamizing Sergeant-ave., from Twentieth to Twenty-third, S. T. Davis.

Toledo, O.—The contract for paving Virginia-st., between Lawrence and Detroit, was awarded Oct. 12 to O'Sullivan & Sheehan for $5,315.30. Logan block on crushed stone will be used. Oneida-st., from Cherry to Walnut, will be paved with Canton brick on broken stone foundation, the contract having been awarded to J. C. Garland for $5,315.30.

Chicago, Ill.—The contract for paving an alley between N. State-st. and Dearborn-ave. with vitrified brick was awarded to the R. F. Conway Company, and for paving Sherman-place with asphalt to the Barber Asphalt Paving Company. The Barber Asphalt Paving Company was also awarded contracts Oct. 21 for asphalt paving on portions of W. Eighty-seventh, S. Forty-eighth and Selden-sts. and Hermitage, S. Irving, N. Park and O'Brien-aves.

St. Paul, Minn.—The contract for furnishing creosoted wood block for paving the Jackson-st. bridge was awarded to the Republic Creosoting Company for $4,847.46. The contract for macadamizing Grand-ave., from Floral to Lawton, and Floral, from Summit-ave. to Heather-place, was awarded to W. J. Prendergast for $3,700. Fielding & Shepley secured the contract for curbing and boulevarding Central-ave., from Rice to Dale, for $12,400.

Kansas City, Mo.—Paving contracts were awarded Oct. 19 as follows: Twenty-eighth-st., from Holmes to alley west, and Thirty-second-st., from Penn to Summit, asphalt, Parker-Washington Company, $2.15 a square yard; Eleventh-st., Indiana to Norton, asphalt, Barber Asphalt Paving Company, $2.15 a square yard; alley east of Santa Fe, Eighth to Ninth, brick, A. R. Mense, $2 a square yard; alley west of Broadway, Sixteenth to Seventeenth, brick, R. J. & W. M. Boyd Construction Company, $2.45 a square yard.

New York City—Contracts were awarded Oct. 12 for paving in Bronx Borough as follows: To John J. Clancy, 6 Bradhurst-ave., for completing the regulating, setting curb, etc., on Two Hundred and Fifth-st., for $11,128; to Asphalt Constr. Company, 207 Broadway, for paving with asphalt block on concrete foundation, Wales and Daly-aves., $29,498; to New York Bermudez Company, 114 Liberty-st., for asphalt paving on concrete founda-

tion on Jackson-ave., E. One Hundred and Thirty-ninth, E. One Hundred and Forty-second, Grove, One Hundred and Sixtieth, One Hundred and Thirty-ninth, One Hundred and Fifty-ninth and Rose-sts., $19,666; to Hastings Pavement Company, 25 Broad-st., for paving E. One Hundred and Fifty-fourth and E. One Hundred and Sixty-second-sts. with asphalt, $20,609, and to the Warner-Quinlan Company, 32 Broadway, for paving with asphalt Longwood-ave., $34,160.

Columbus, O.—Paving contracts were awarded Oct. 7 as follows: Cleveland and Trinidad Paving Company, entire length of High-st., asphalt, $30,211.95; Blake Asphalt and Maintenance Company, Broad-st., from Third-st. to Taylor-ave., $8,463; Geigle & Garnes, Noble-st., Pearl to Fifth, brick, $7,521.80; Frank J. Fisher, Grant-ave., Rich to Main, Wassel block, $3,832.25; N. B. Abbott & Co., Nelsonville block, $22,862; Buckeye Engineering Company and Construction Company., Long-st., from Scioto-st. to Winter-ave., brick, $2,155.55; D. E. Sullivan & Son, Sixth-st., Town to Main, brick, $6,824; Fourth-st., Livingston-ave. to Booth-st., brick, $1,767.50; Almond alley, Seventeenth to alley west of Miami-ave., $1,617.80; Mt Vernon-ave., Neilston to Taylor, brick, $2,887; Pennsylvania-ave., First to Second-ave., brick, $4,324.23.

SEWERS.

CONTEMPLATED WORK.

Marion, Mass.—A sewerage system is proposed.

Oxford, Miss.—The sewerage system will be extended.

Marion, S. D.—A sewerage system is contemplated for this town.

Madison, Wis.—Improvements to the sewerage system are proposed.

Amarillo, Tex.—This city voted to issue $45,000 bonds for sewer purposes.

Havre de Grace, Md.—City council has accepted new plans for a sewerage system.

Oakes, N. D.—The question of constructing a sewerage system is being agitated.

Sutersville, Pa.—A sewerage system is contemplated.

Pipestone, Minn.—Council is considering the question of constructing a sewerage system.

Little Rock, Ark.—E. A. Kingsley, supt. of pub. wks., says that the new main sewers are needed.

Elyria, O.—The board of health has approved plans for building sewers and a sewage disposal plant.

Oklahoma City, Ok.—The question of issuing bonds for building sewers will be voted on Nov. 8.

Elberton, Ga.—The question of issuing $20,000 bonds for sewer purposes will be voted on Nov. 10.

Oswego, N. Y.—The citizens in the Seventh ward have demanded the construction of a new sewerage system.

Clinton, Ind.—The establishment of a sewerage system, the work to begin next spring, is contemplated.

Lawrence, Mass.—A new sewer to aid in the abatement of Potter's Pond nuisance is desired. A. D. Marble, cy. engr.

Thomasville, Ga.—The question of issuing $25,000 bonds for extending the sewerage system will be voted on Nov. 10.

Colusa, Cal.—A report has been submitted to the board of trade recommending the construction of a sewerage system.

Maryville, Mo.—This city will vote, Nov. 15, on the issue of $25,000 bonds for the construction of additional sewers.

Cleveland, O.—The question of issuing $500,000 bonds for constructing the intercepting sewer will be voted on in November.

Hopkinsville, Ky.—The question of issuing $50,000 bonds for constructing a sewerage system will be voted on in November.

Dover, Del.—The question of constructing a new sewerage system, which was authorized by the last Legislature, will be voted on.

Rome, N. Y.—City Engineer Schillner has been directed to prepare plans for a storm water sewer from Depeyster-st. to the old canal.

Geneva, N. Y.—The extension of the sewerage system through the Italian colony is considered absolutely necessary by the board of health.

Holly Springs, Miss.—A resolution has been passed for issuing $19,000 bonds for constructing a sewerage system and sewage disposal works.

Madison, N. J.—Plans for a sewage disposal plant for this city have been submitted to the sewerage committee by Snow & Barbour of Boston.

Fayetteville, Ark.—City council has passed an ordinance creating an improvement district in the whole city for the purpose of building a sewerage system.

Watervliet, N. Y.—The reconstruction of the sewer in Grotto Court with a 12-in. pipe to carry off the surface water of that vicinity is considered necessary.

South Bend, Wash.—City council decided, Oct. 17, to build a large sewer to drain the flats in the upper part of the city, with several laterals 300-ft. in length.

Jersey City, N. J.—Plans and specifications have been prepared for Jackson-ave. district sewer. The plans call for a brick and steel sewer nearly 2-mls. long.

Racine, Wis.—The bd. of pub. wks. estimates the cost of building a sewer in Wisconsin-st. at $1,679, and Carroll-st. at $548. A resolution has been passed directing that plans be prepared for a sewer in Spring-st.

Aberdeen, S. D.—The question of remodeling the sewerage system is being considered and a committee, consisting of the city engineer and a member of the city council may visit some Eastern cities to study sewerage methods.

Woodlawn, Ala.—An ordinance was introduced at a meeting of the mayor and bd. of aldermen Oct. 20, providing that the question of issuing $30,000 bonds for

constructing a sewerage system to connect with the county trunk sewer be voted on.

CONTRACTS TO BE LET.

Olivia, Minn.—Bids are asked until Nov. 5 for constructing ditch No. 15. H. J. Lee, co. audt.

Omaha, Neb.—Sealed bids are asked until Nov. 4 for constructing a sewer in 35th-st. Andrew Rosewater, chmn. B. P. W.

Brazil, Ind.—Bids are asked until Nov. 1 for constructing 4 mis. of storm and sanitary sewers. Geo. U. Fletcher, cy. engr.

Shakopee, Minn.—Bids are asked until Nov. 21 for constructing ditch No. 7, with laterals 1, 2 and 3. J. H. Moore, co. audt.

McKee Rocks, Pa.—Bids are asked until Nov. 7 for constructing 1,110 ft. of 10, 12, 15 and 20-inch sewers. S. L. Gardner, boro. engr.

Fort Bayard, N. M.—Sealed bids are asked until 11 a. m., Nov. 8, for constructing a sewage purification plant. Capt. H. M. Powell, Q. M.

Perth Amboy, N. J.—Sealed bids are asked until Nov. 7 for constructing 737 ft. of 24-in. clay pipe sewer and 2 manholes. Matthew Weirup, st. comr.

New Madrid, Mo.—A contract will be let at public outcry, Nov. 9, for 291,675 cu. yds. of drainage and levee work. Joel Dunn, engr., Morehouse, Mo.

McLeansboro, Ill.—Bids are asked until Nov. 12 for constructing a drainage ditch in sub-drainage district No. 1. D. D. Holland, chmn. drainage comrs.

Brooklyn, N. Y.—Bids are asked until Nov. 2 for constructing sewers on Vandam and Sherman-sts. and Greenwood-ave. Martin W. Littleton, boro. prest.

Marion, Ind.—Sealed bids are asked until 7:30 p. m., Nov. 1, for constructing a sewer in an alley between Washington and Boots-sts. John O. Wilson, cy. clk.

Vicksburg, Mo.—Sealed bids are asked until Nov. 7 for putting in 12-in. terra cotta pipe to drain road No. 106, near Jacob's store. J. D. Laughlin, chancery clk.

Brainerd, Minn.—Sealed bids are asked until Nov. 7 for building certain lateral sewers in sewer dist. No. 1, including 22 manholes and 2 lamp holes. F. E. Low, cy. clk.

Cincinnati, O.—Sealed bids are asked until Nov. 18 for constructing sewers and drains in Academy-ave., from W. Eighth-st. to Vincent-ave. Geo. F. Holmes, clk. B. P. S.

Omaha, Neb.—Bids will be received until Dec. 2 for constructing the Jones-st. sewer. Only one bid was received Sept. 30 for this work. Andrew Rosewater, chmn. B. P. W.

Salem, Mass.—Sealed bids are asked until Nov. 4 for furnishing 1,600-lin. ft. 60-in. and 10,000 lin. ft. 30-in. c. i. pipe and specials. Joseph N. Peterson, chmn. sewerage comn.

Jacksonville, Fla.—Sealed bids are asked until Nov. 4 for furnishing and laying about 428 ft. 36-in., 236 ft. 30-in. 3,622 ft. 24-in. brick drains, and 1,269 ft. terra cotta drains, and building manholes. B. F. Dillon, chmn. bd. trustees.

Marion, O.—Sealed bids are asked until Nov. 10 for constructing the Blaine-ave. ditch, including 1,900-lin. ft. of single-ring and 2,272-ft. of double-ring brick arch. L. M. Hipsher, co. audt.

Ashland, Wis.—Sealed bids are asked until Nov. 15 for constructing a sewerage system at the Lac du Flambeau school. S. W. Campbell, Indian Agt., Ashland; W. A. Jones, Comr. Indian Affairs, Washington, D. C.

New Orleans, La.—Sealed bids are asked until Nov. 30 for constructing 16,000-ft. of wood-lined canals, including 145,000-cu. yds. of excavation, 390-cu. yds. of concrete and 21,000-lbs. of steel rods. F. S. Shields, secy. sewerage and water bd.

CONTRACTS AWARDED

Nashville, Tenn.—The contract for constructing a brick sewer was awarded to J. F. Allen for $3,260.

Decatur, Ill.—Tuttle & Co. secured the contract for building a sewer on S. Main-st. for $2,826.23.

Mitchell, S. D.—The contract for constructing a sewerage system was awarded to I. W. Seaman for $60,000.

Bucyrus, O.—A. H. Gardner was awarded the contract for building a sewer on Faustina,-ave. for $1,558.78.

St. Paul, Minn.—Christ Johnson has been awarded a contract for constructing a sewer on Mount Airy-st. for $1,431.

Salem, Mass.—The contract for constructing a section of the North river trunk sewer was awarded to Patrick McGovern.

Fargo, N. D.—Gilbert Haggert was awarded contracts for building sewers on Second-ave., S. Roberts-st. and Tenth-ave, north.

Waterbury, Conn.—The contract for constructing a new sewer on N. Willow-st. has been awarded to Edward McManus for $8,940.

Ligonier, Ind.—The contract for building a sewer in Albany-st. was awarded to the Northern Construction Co. of Elkhart.

Topeka, Kan.—The contract for building a sewer in the Fifth ward was awarded Oct. 3 to Brooks & Gilmore for $57,-337.39.

Oklahoma City, Ok.—The contract for constructing lateral sewers was awarded, Oct. 8, to Joe Severns of Guthrie for $5,000.

Rockford, Ill.—S. Vandewalker of Belvidere, Ill., was awarded the contract for building sewers in Eleventh and John-sts. and Grant-ave.

Glenwood, Minn.—The contract for building 2,500 ft. of sewers and a septic tank was awarded to Ilstrup & Olson of Minneapolis Oct. 9.

Winona, Minn.—John Degnan was awarded the contract for building a sanitary sewer on Fifth-st., from Vila to a point 845 ft. distant.

Peoria, Ill.—The contract for constructing the East Bluff sewer was awarded

Oct. 19 to Harding & Nelson of Milwaukee for $87,969.

Grand Rapids, Mich.—The contract for constructing a sewer in Fulton and Island-sts. has been awarded to Kloot & Vanderveen for $15,400.

Anadarko, Okla.—The contract for building a sewerage system was awarded Oct. 17 to Doyle & Schwartz of Colorado Springs, Colo., for $19,120.

Paducah, Ky. — Robertson & Gardner were awarded the contract Oct. 10 for constructing the storm water sewerage system on Kentucky-ave for $4,363.02.

Centralia, Ill. — The contract for constructing two mis. of sewer outlet and a septic tank was awarded to D. W. Norton & Co. of Vincennes, Ind., for $15,408.80.

Pine Bluff, Ark. — The contract for building sewers in District N. 3 was awarded to Dunnegan & Sykes of Shenandoah, Ia., for $35,000. About 11 miles of sewer will be built

Bloomington, Ill. — The contract for constructing the Miller Park sewer was awarded Oct. 8 to D. H. Rider of this city at 73 cents for 18-in. and 85 cents for 12-in. pipe sewer.

Irvington, N. J. — Contracts for constructing the extensions to the lateral sewer system was awarded Oct. 20 as follows: Section 3, Charles Ippolito of Orange, $11,220.64; section 4, Antonio Costa, Orange, $8,740.48; James Christie, $11,452.79.

Vailsburg, N. J.—Special.—Eugene A. MacMurray, ch. engr., 22 Clinton-st., Newark, says that on Oct. 12 the second section of the sewerage system was awarded to Mr. Christie, late of Headley & Christie, for $10,000. They are just completing the work on the first section. Its cost was $62,569.

WATER-WORKS.

Cincinnati, O.—Dudley V. Sutphin was appointed co-receiver Oct. 20 of the United States Construction Company of Milwaukee, whose contract for building reservoirs for the Cincinnati water works system was annulled some time ago. The property in Ohio is estimated at $25,000 in machinery. The total assets are $50,000 and the liabilities are $100,000.

Appleton, Wis.—Press reports of Oct. 20 stated that a temporary injunction would be granted the Appleton Water Works Company against permitting the city to sell the water works bonds. The time limit for the sale of the bonds has expired and the city can sell the bonds at any time if the money is needed for water works purposes.

Temple, Tex.—The artesian water works system, which was sold at sheriff's sale recently to satisfy a judgment, will continue in operation. The plant represents an investment of more than $30,000 and sold for less than $4,000. It is in good condition for operating and the mains cover the entire business section and a large part of the residence section.

CONTEMPLATED WORK.

Sandwich, N. H.—A water precinct will be formed here.

Kenmore, N. Y.—The installation of a water meter system is contemplated

South Norwalk, Conn.—Plans will be completed soon for the proposed new filter plant

Canajoharie, N. Y.—The board of trade favors municipal water works. Willis Bullock, mayor.

Jersey City, N. J.—Bids will be asked soon for a new water main in the Hudson City section.

Moorestown, N. J.—The water company is considering three plans for improving the water supply.

Santa Anna, Cal.—The question of extending and enlarging the water works system is being discussed.

Melrose, Mass.—The city treasurer has been authorized to borrow $10,000 for water works purposes.

Homestead, Pa.—The council of West Homestead has decided to extend the water mains of that borough.

Eureka, Ill.—Plans are being discussed for issuing bonds for improving and extending the water system.

Martin's Ferry, O.—The water committee has been authorized to extend the water system to Lombard Heights.

McKeesport, Pa.—The water commissioners have asked for an appropriation of $5,000 for additional wells.

Minneapolis, Minn.—The public affairs committee of the Commercial Club approves the adoption of a filtration plant.

Attleboro, Mass.—The state board of health has approved the plans for a new source of water supply for this city.

Agawam, Mass.—The question of securing a water supply from West Springfield is being considered. J. A. Roy, mem. com.

Stanhope, N. J.—The question of installing a system of water mains will be voted on Nov. 18. Austin L. Van Arsdale, boro clk.

St. Louis, Mo.—A bill has been passed appropriating $50,000 out of the water meter fund for the purchase of water meters.

Columbus, O.—The board of trade unanimously favors the issue of bonds for filtration and a softening plant for the city water.

Philadelphia, Pa.—The city council's committee approved Oct. 18, an appropriation to increase the water supply of West Philadelphia.

Chicago, Ill.—The sub-committee of the Council committee on water has recommended compulsory installation of water meters by all property owners.

Berea, Ky.—Dr. D. K. Pearson of Chicago has presented Berea College with $50,000 for constructing a water works system, according to press reports.

Corsicana, Tex.—A committee has been appointed to secure an engineer to estimate the value of the local water works with a view to its purchase by the city.

Bangor, Me.—The City Council voted Oct. 11 to purchase and install an alum

plant for use in connection with filtration plant now in use at the water works.

Chattanooga, Tenn.—The City Water Company has agreed to build and maintain a pumping station and stand-pipe capable of furnishing water to the residents of Hill City, a suburb.

The question of issuing bonds for constructing water works has been favorably voted on at the following places: Camilla, Ga.; Menasha, Wis.; Clyde, O.; Forestport, N. Y.; Spooner, Wis.

Elyria, O.—Council decided Oct. 11 to grant $25,000 for a new pump and the extension of the mains. This city will probably sell water to the Sheffield Land Company of Lorain.

Menasha, Wis.—The finance committee was directed Oct. 17 to negotiate with some good hydraulic engineer to superintend the construction of the proposed water works system.

Tacoma, Wash.—The adoption of the South Tacoma well water supply, to be constructed along plans and specifications prepared by L. Forrest McConihe, is favored by the City Council.

The construction of water works is contemplated at the following places: Flora, Ill.; Mt. Olive, Ill.; Covington, La.; Chewelah, Wash.; Wessington Springs, S. D.; Rockton, Wis.; Benson, Neb.; Murray, Utah; Tennille, Ga.; Camden, Ala.

The question of issuing bonds for the construction of water works will be voted on at the following places: Benson, Neb., Nov. 8; Ft. Pierre, S. D., Nov. 8; Melrose, Minn., Nov. 8; Berlin, Md.; Madisonville, Ky., Nov. 8; Tifton, Ga., Nov. 15; Utica, Miss.; Oklahoma City, Okla., Nov. 8; Ukiah, Cal.

Brooklyn, N. Y.—Water Commissioner Oakley is considering the rejection of all bids for the construction of auxiliary fire service mains in this borough, according to press reports of Oct. 18. Confusion in the specifications for castings is said to have given cause for dissatisfaction among the bidders.

CONTRACTS TO BE LET.

Salem, Ind.—Bids are asked until Nov. 7 for a water works system, pumping, etc., at the Poor Asylum. Frank E. Morris, co. audt.

Salem, Mass.—Bids are asked until Nov. 4 for 1,500 ft. of 60-in. and 10,000 ft. of 30-in. water pipe and specials. Joseph N. Peterson, chmn. sewerage com.

Montgomery, Ala. — Sealed bids are asked until Nov. 7 for furnishing and installing an air compressor at the Court-st. pumping station. R. S. Williams, cy. treas.

Waterman, Ill.—Sealed bids are asked until 1 p. m. Nov. 7 for the erection of one 30,000 U. S. gallon water tank and tower, including foundations, riser pipe, etc. S. M. Henderson, prest. bd. trustees.

North Milwaukee, Wis. — Sealed bids bids are asked until 8 p. m Nov. 1 for laying a line of 4-in. water pipe on Thirty-seventh-ave., from N. Milwaukee-ave. to Harrison-ave., and from Villard-ave. to a point near Custer-ave. W. E. Chase, vil. clk.

Chicago, Ill.—Bids are asked until Nov. 27 for furnishing and erecting in each of the stations known as the Central Park-ave. and the Springfield-ave. pumping stations, one vertical triple expansion pumping engine of 40,000,000 gals. each. F. W. Blocki, comr. pub. wks.

New Orleans, La. — Sealed bids are asked until Nov. 9 for furnishing and erecting four 20,000,000 gal. pumping engines, to work against a 218 ft. head; three 40,000,000 gal. centrifugal pumps to work against a 25 ft. head; three engines to operate these centrifugal pumps; two 150 K. W., 550 volt D. C. generators; two engines to drive these generators; six 400 H. P. water tube boilers. F. S. Shields, secy. sewerage and water bd.

CONTRACTS AWARDED.

Plymouth, Ind.—The contract for constructing water mains has been awarded to William Everly of this city.

Tabor, S. D.—The contract for constructing a water works system has been awarded to W. L. Bruce of Yankton S. D.

Fargo, N. D.—James Kennedy of this city was awarded the contract for constructing water main extensions in Robert-st.

Marshall, Mo.—The contract for a water works system was awarded Oct. 5 to G. Jaeger of Rich Hill, Mo., for about $20,000.

Newton, Pa.—The contract for a storage reservoir was awarded to the Bell Engineering and Construction Co. of New York City for $7,285.86.

Highland Park, Ill.—The contract for extending the water main on Third-st. was awarded Oct. 20 to John O'Herron & Co. of Chicago for $2,017.50.

Atlantic City, N. J. — Frederick T. Moore secured the contract Oct. 10 for building the wooden conduits in certain streets to the meadows for $6,765.

New York City.—The Panama Canal Commission has awarded a contract for 43,000 tons of cast iron pipe to the United States Cast Iron and Foundry Co. at $21.70 per ton.

BRIDGES.

Muskegon, Mich.—A bridge across Muskegon River at Bridgeton is contemplated.

Fargo, N. D.—Bids are asked until Nov. 7 for building certain bridges. A. G. Lewis, co. audt.

Mitchell, S. D.—Bids are asked until Nov. 16 for building 2 bridges. O. D. Stearns, co. audt.

Evansville, Ind.—Bids are asked until Nov. 17 for building 8 steel bridges. Harry Stinson, co. audt.

O'Neill, Neb.—Bids are asked until Nov. 9 for building a pile and stringer bridge. E. S. Gilmour, co. clk.

Carrollton, Mo.—Bids are asked until

Nov. 10 for building 8 wood or steel bridges. Silas Ballard, br. comr.

Lyons, Mich.—The question of building a new bridge across Maple River, at Muir, will be voted on Nov. 8.

Monroe, La.—Bids are asked until Nov. 15 for building 2 steel bridges across Bayou Boeuf. Police Jury.

Noblesville, Ind.—Bids are asked until Nov. 7 for building a high-truss bridge over Stony Creek. Co. comrs.

Dillon, Mont.—Bids are asked until Dec. 5 for building a bridge across Big Hole River. W. M. Oliver, chmn. co com.

Chippewa Falls, Wis.—The voters of Eagle Point voted, Oct. 13, to build a bridge across Chippewa River at Jim Falls.

Statesville, Ga.—Bids are asked until Nov. 8 for building a steel bridge over the Alapaha River. G. W. Prime, clk.

Peru, Ind.—Bids are asked until Nov. 10 for constructing steel bridges with concrete abutments. C. W. Macy, co. audt

Pawnee City, Neb.—Bids are asked until Nov. 4 for erecting all wooden and steel bridges in county. J. M. Hurd, chmn. co. comrs.

Manila, P. I.—Bids are asked until Dec. 1 for constructing a bridge over the Pasig River. John M. Tuther, secy. Manila municipal board.

Little Falls, Minn.—Bids are asked until Nov. 11 for building a steel bridge across Platte River, in town of Agram Wm. A. Butler, co. audt.

Topeka, Kas.—Bids are asked until Nov. 7 for raising the Central-ave. bridge over Soldier Creek, on Central-ave. 4 ft. J. H. Squires, cy. clk.

Calgary, Alberta, Can.—Bids are asked until Nov. 12 for building a steel superstructure on a foundation prepared by the city. F. W. Thorold, cy. engr.

Terre Haute, Ind.—Bids are asked until Nov. 14 for constructing the Meneely bridge, Nevins, twp.; Jencks bridge, Otter Creek twp. Jeremiah Blockson, chmn co. comrs.

Cleveland, O.—Bids are asked until Nov 9 for constructing steel bridges, stone, concrete and concrete-steel masonry and excavation in certain twps. Julius C. Dorn, co. clk.

New Orleans, La.—Sealed bids are asked until Nov. 4 for constructing a viaduct over the tracks of the Southern Pacific R. R. Co. on the line of Newton-st. Algiers. V. Tujague, compt.

STREET LIGHTING.

Gallitzin, Pa.—An electric light plant is proposed.

Greenspring, O.—An electric light plant is proposed.

Walworth, Ill.—The question of electric lights is being agitated.

Flora, Ill.—The question of an electric light plant is being agitated.

Spring Lake, Mich.—This town voted in favor of being lighted by electricity.

Hartwell, Ga.—Bids will be asked soon for constructing an electric light plant. W. Johnson, mayor.

Crab Orchard, Neb.—The citizens are discussing the question of installing an electric light plant.

Columbus, Neb.—A franchise for a gas lighting plant has been granted to E. B. Pickhardt of Chicago.

Covington, Ky.—Council voted to take immediate action towards building a municipal lighting plant.

Sumter, S. C.—Special.—D. G. Zeigler advises us that he is a possible purchaser of a power plant to generate electricity.

Tacoma, Wash.—Bids are asked until Nov. 14 for supplying this city with electricity and power for 10 yrs. Cmr. pub. wks.

Baltimore, Md.—Bids are asked until Nov. 2 for electric wiring of the Baltimore city jail. Edw. D. Preston, inspector bldgs.

Milwaukee, Wis.—Estimates will be secured of the cost of building a municipal lighting plant for this city. Cy. Engr. Poetsch.

Saratoga, N. Y.—The contract for public lighting for a term of 4 years was awarded to the Saratoga Gas, Electric Light and Power Co.

Divennon, Ill.—This city voted, Oct. 14, to issue bonds for constructing an electric light plant and bids will be asked at once.

Catlettsburg, Ky.—Bids are asked until Nov. 3 for a franchise for lighting the streets with electricity for 10 years. John J. Montague, special cmr.

New Albany, Miss.—Bids will be received until Nov. 15 for erecting an electric light and water works plant. Wm. F. & A. D. Wilcox, engrs., Jackson.

The issue of bonds for constructing electric light plants has been favorably voted on at the following places: Camilla, Ga.; Buford, Ga.; Dallastown, Pa.

Mount Morris, N. Y.—A franchise to operate an acetylene gas plant here has been granted the J. K. Rush Acetylene Gas Generator Company of Canandaigua.

Oakland, Neb.—The contract for erecting the municipal lighting plant for this place has been awarded to Towe & Harnson of Sioux City, Ia., for $5,900.

Johnson City, Tenn.—Bids are asked until Nov. 14 for furnishing and delivering electric light fixtures. Paul E. Divine, treas., Mountain Branch, N. H. D. V. S.

Glasgow, Mo.—Special.—W. R. DeWitt, U. S. asst. engr., desires information regarding the installation of an electric light plant for a town of 2,000 population.

Litchfield, Ill.—A franchise has been granted to C. B. Munday, jr., for constructing, maintaining and operating an electric light and gas plant in this city.

Newark, O.—Council has been asked to change the present system of street lighting to the series alternating system. J. W. Stewart, supt. municipal electric lgt. plant.

Jefferson City, Mo.—The Jefferson City Electric Light plant has been sold to W. N. Horner, representing a Chicago syndicate, for $50,000. The plant will be enlarged and improved.

Warren, Pa.—Bids are asked until Nov 5 for lighting this borough with electricity or other suitable illuminant for public lighting for five or ten years. A. L. Scheilhammer, chmn. lgt. com.

Omaha, Neb.—The North Omaha Improvement Club favors the establishment of a municipal electric light plant. This city will vote on the issue of bonds to buy or build a municipal electric light plant.

Oneida, N. Y.—J. George Kaelber and Richard Doyle of Rochester are taking steps toward acquiring lands bordering on Limekiln Falls and will build a power house and be in readiness to furnish this city with light and power.

Philadelphia, Pa.—Special.—The Bonneville Portland Cement Co., 2029 Land Title Bldg., advises that they desire to obtain prices on a 100-hp., 550 volts, compound motor, low speed, also a 85-hp. motor direct current. W. H. Harding, prest.

Elkhart, Ind.—The Indiana & Michigan Electric Company are preparing plans, according to press reports, for the construction of a transmission line from its dams along St. Joseph river, to carry current to Indianapolis, Ind., and Louisville, Ky.

Grand Rapids, Mich.—Special.—A syndicate of local men, comprising Frank T. Hulswit, E. A. Stowe, C. C. Fowler, Howard Thornton, Ralph Child, L. T. Wilmarth and Guy W. House, have acquired control of the gas lighting plant of Cheboygan and will improve and operate it.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Detroit, Mich.—The question of a municipal garbage-reducing plant is being agitated.

Orange, N. J.—A resolution has been passed declaring that a garbage crematory should be established as soon as possible.

Parsons, Kas.—Sealed bids are asked until Nov. 14 for furnishing a street sweeper for use on the streets of this city. T. B. J. Wheat, cy. clk.

Philadelphia, Pa.—The contract for the collection and disposal of garbage was awarded, Oct. 11, to the American Product Co., for $560,000, which is $63,000 less than a bid submitted by the same company in September.

PARKS.

Knoxville, Tenn.—The ladies of this city are interested in a project to establish a system of small parks.

Salem, Mass.—Plans for a series of boulevard gardens, to be built in the middle of Broad-st., have been prepared by Geo. F. Ashton, cy. engr.

TOO LATE FOR CLASSIFICATION

Gibson City, Ill.—The City Council voted to pave several streets.

Marion, O.—Bids are asked until Nov. 9 for furnishing fifty gas street lamps. B. P. S.

Watertown, Wis.—Bids are asked until Nov. 5 for constructing a storm sewer and appurtenances. Frank S. Weber, city clerk.

Lakewood, O.—Sealed bids are asked until Nov. 5 for building stone sidewalks on Detroit-st. Henry J. Sensel, village clerk.

Houston, Tex.—City Engineer Dormant has been directed to ask for bids for the alteration of arrangements at the sewer pumping plant.

Wichita, Kas.—Sealed bids are asked until Nov. 7 for constructing sewers in storm water sewer district No. 1. J. L. Leland, city clerk.

Bordentown, N. J.—The contract for building a water works system was awarded Oct. 21 to Hugh J. Reilly of New York City for $66,157.

Norwalk, S. D.—The City Council has decided to ask for bids for a new street lighting contract, both alternating and direct current systems.

Springfield, Ill.—Bids are asked until 3 p. m., Nov. 1, for building brick sidewalks, cement sidewalks, brick and cement approaches, etc. Harry H. Devereux, president Board Local Improvements.

Hollidaysburg, Pa.—The contract for sewers in First and Second districts was awarded Oct. 10 to A. Foge as follows: Gerber-st., terra cotta pipe, $2,491; Brush Run sewer, concrete, $64,155.20.

Brooklyn, N. Y.—Bids are asked until Nov. 2 for asphalt repaving on a number of streets; also for regulating, grading, curbing and paving sidewalks on Coney Island-ave. Martin W. Littleton, borough president.

Lincoln, Neb.—The City Council awarded a contract Oct. 22 for a municipal lighting plant and a joint power house for the water system and the electric light plant to the Nebraska Electric Company of Omaha for $61,930.45.

Seattle, Wash.—Sealed bids are asked until Nov. 16 for constructing a stone reservoir of 500,000 gallons capacity and pump house, installing motor driven triplex pump, and laying connecting water mains at Ft. Wright. Edward A. Shuttleworth, captain and quartermaster U. S. A.

Oakland, Cal.—City Council took the initial step Oct. 17 toward providing this city with a municipal plant for furnishing salt water for street sprinkling purposes. The Board of Public Works is authorized to incur the necessary expense of having plans drawn for a salt water plant embracing a district from the lake west to Market-st. Standpipes are to be erected and pipes laid throughout the district.